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Le Bureau de Prix

During a recent holiday spent in the Vosges Mountains, we broke our journey at Nancy to examine the work of the local laboratories of the *Centre Technique*. Similar establishments are to be found at Marseilles, Lyons, Bordeaux, Charleville and other large towns. This particular one caters for about 250 foundries, of which about half co-operate enthusiastically in the services available. It is housed in a building of outstanding beauty and historical interest. All the usual services, such as chemical analysis, sand testing, and the determination of mechanical properties are available, and stress is invariably placed on the interpretation of the results to the smaller foundry owners. In this task the local staff is helped by regular visits from the heads of the various departments in the central offices in Paris. Additionally there is the *Bureau de Prix*.

This department was originally staffed by one accountant, but now there are three or four. The service given, which is confidential, is of a noteworthy type. A simple beginning is made by getting the founder to fill up a form which places against the name of every workman employed the time he spends on moulding, core-making, dressing, maintenance and so forth. The quantity and value of raw materials are also ascertained. Then, for each foundry owner there is prepared a chart for each three months. This consists of two black vertical lines, showing the lowest and the highest labour costs recorded for sand preparing, cleaning, mould drying and all the various duties that are undertaken during the making of a casting. Then, centrally, in red, is recorded the actual cost at the foundry of the recipient. We examined the chart of number *x*, which clearly showed efficiency in certain departments and gross inefficiency in others.

By focusing attention on the weakest sections, the battle for efficiency is half won, but, by resorting to the immense technical resources available, practical solutions are detailed. Naturally, this will on occasion demand the installation of new plant and herein there are great difficulties, as, with the devaluation of the franc, the capital costs involved seem to be out of all proportion to earlier investments. There is much to admire, and probably to emulate, in this marriage between cost ascertainment and technical services on a district basis, plus real expert help from the centralised resources. Whenever, and this is not an unusual experience, we have discussed costing with the smaller foundry owner, we have received the impression that he has a preference for guessing his prices and pocketing the money he would have to pay out for a clerk to tell him what he believes he already knows. At Nancy, we felt that a solution had been found for avoiding any additional internal clerical employment. On the other hand, the cost of three or four clerks spread over all the foundries in the district cannot be high. Allowing for differences in the outlook between the French and British, it would seem well worth trying out by either regional or other foundry associations. Actually something of the kind is being practised by one group in this country with highly beneficial results.

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Purchasing Officers' Association

During a conference of the secretaries of the 24 branches of the Purchasing Officers' Association, Mr. E. A. Carpenter, President of the Manchester Chamber of Commerce, and principal guest speaker, deprecated the fact that so much industrial buying was in the hands of untrained people. In his work with the new Dollar Exports Board, he had found that many manufacturers were buying materials at uneconomic prices simply because purchasing was in the hands of a Government department, and he had no doubt that Government bulk buying was a contributory factor to the situation in which some of the nation's goods were dear in relation to those of its competitors. The country would do better if the people who were trained in buying were given the freedom to employ their skill.

New Technical Committee

The Bronze and Brass Ingot Manufacturers' Association have decided to form a technical committee to deal with any relevant matters which may be raised by members, ingot users or other bodies. The composition of the committee will be as follows: Chairman, Mr. Alfred Allcock (Association President); Mr. A. E. Cohen (A. Cohen & Company, Limited); Mr. J. E. Hayes (Sheffield Smelting Company, Limited); Mr. W. G. Mochrie (Tyseley Metals Works, Limited); Mr. J. B. Watson (H. B. Barnard & Sons, Limited), and Mr. G. T. Whitehouse (Metal Products (Willenhall), Limited).

Australian Linseed Progress

Linseed growing in Australia, which was established with the experimental sowing of only 30 tons of seed in 1947, last season harvested 18,500 acres, and a further increase of between 60 and 80 per cent. is expected this year. Despite uncertainty about growers' intentions, a New South Wales agronomist estimates that there will be an increase of 80 per cent. to 36,000 acres. The linseed crushing company, which takes the whole of the crop, reports that present applications for seed represent an increase of 62 per cent. and the planting of 30,000 acres. This may be increased, as the crop is profitable, and as growers gain experience better results are being obtained.

Bell's Asbestos & Engineering's Deal

Bell's Asbestos & Engineering, Limited, Slough, has acquired the entire share capital of W. N. Baines & Company, Limited, valve and steam fittings manufacturers, of Rotherham, Yorks. As part of the terms of the acquisition, the vendors have subscribed for 75,000 5 per cent. second cumulative preference £1 shares of Bell's Asbestos & Engineering, Limited, at 25s. a share.

Mr. Andrew Thomson will continue to act as managing director of W. N. Baines & Company, whose other two directors will be Mr. H. F. Allen and Mr. L. J. C. Wood, both of Bell's Asbestos. Mr. Thomson also joins Bell's board.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

From Sir Guy Nott Bower

"NATIONAL ECONOMY"

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—My attention has been directed to an article under the heading "National Economy" in your issue of July 14.

This article centres around a technical Paper* presented at the Cheltenham Conference of the Institute of British Foundrymen by Mr. M. D. Edington, who is Chairman of the Northern Section of the Coke Oven Managers' Association. The article seems to suggest that it is the policy of the National Coal Board to tell the users of foundry coke how to operate their foundry. I would like to point out that, on the contrary, it is the policy of the National Coal Board to co-operate closely with organised industrial consumers. It should only be necessary to add that, through membership of the British Coking Industry Association, the National Coal Board is, in fact, in very close contact with the foundry trade by reason of joint consultation which takes place between the British Coking Industry Association and the Council of Ironfoundry Association.—Yours, etc.,

GUY NOTT BOWER,
Director of Public Relations,
National Coal Board.

Hobart House,
Grosvenor Place,
London, S.W.1.
July 25, 1949.

*Printed on page 149 of this issue.

Meehanite Process in Holland

Licences have recently been granted by the International Meehanite Metal Company, Limited, to four of the leading Dutch foundries making a wide range of castings—from roadway and stove plate work up to some of the largest steam and Diesel engines. These foundries are:—Ijzer-en Metaalgieterij "De Globe," Tegelen; Netherlands Dock & Shipbuilding Company, Amsterdam; N. V. Wilton Fijenoord, Schiedam; and N.V. Holland-Bergen op Zoom, Bergen op Zoom.

Their combined output of castings will eventually reach nearly one-fifth of the iron castings produced by Dutch foundries. Already the firm of De Globe has reached, in less than a year, such a stage of manufacture that one of the leading Dutch cutting tool suppliers for machine tool work is using Meehanite castings for many milling cutter bodies, and tungsten carbide tipped tools. They have further begun to contribute research results to the Meehanite Research Institute which will eventually benefit all the group of licensees throughout the world, and their engineering construction customers.

The Influence of Heating Rate in Malleable Iron Annealing*

By S. W. Palmer, A.R.I.C., A.I.M.†

(*Continued from page* 118.)

Experiments with Blackheart Malleable Iron

A marked difference in the microstructure of whiteheart malleable iron having been found as a result of the use of slow and rapid heating rates, a similar investigation was then carried out for blackheart malleable iron.

A number of coke-fired pit-furnace crucible melts were carried out and 0.564 in. dia. standard shaped tensile bars were cast from each melt. Each melt contributed two such test-bars to each of two annealing experiments, designated hereafter as Anneals A_1 and B_1. The annealing cycle for Anneal A_1 was as follows: 6 hours heating period from 500 to 930 deg. C.; 30 hours at 930 deg. C.; 4 hours cooling from 930 to 800 deg. C.; and 50 hours cooling from 800 to 650 deg. C.

The cycle for Anneal B_1 was precisely the same except for a heating period of 45 hours from 500 to 930 deg. C. In both anneals the test-bars were packed in sand which contained a small percentage of plumbago. A total of 22 melts were involved in this investigation. Many of them received additions before pouring, were cast under different mould conditions, or received some form of preheating treatment before annealing. For the purpose of this Paper, however, only 11 of these melts have been included. The chemical composition of each melt, the treatment given and the mechanical test results are listed in Table III for Anneals A_1 and B_1.

A metallographic examination was made of all the annealed test-bars and, as for the whiteheart material, it was immediately obvious that the two rates of heating employed had markedly influenced the microstructure. It was apparent that, whereas a 6-hour heating period had resulted in large dispersed temper-carbon aggregates, the 45-hour heating period had produced materials containing quite numerous and much smaller temper-carbon aggregates which tended to be compact in form. The more numerous temper-carbon aggregates in the Anneal B_1 materials had facilitated much more secondary graphitisation during cooling, with the result that these materials were practically free from pearlite, except near the edge of the section. On the other hand, many of the Anneal A_1 materials contained appreciable amounts of pearlite at the centre of the section. It was noticeable that rather less pearlite-rimming had occurred in the Anneal B_1 materials. The photomicrographs shown in Figs. 18 to 21 serve to illustrate the differences observed between Anneal A_1 and Anneal B_1. The difference in temper carbon aggregate size and distribution in these two anneals was so distinct that nodule counting was considered unnecessary.

Discussion of Results from Experiments with Blackheart Material

The material obtained from Anneal A_1 can be regarded as of suitable quality to satisfy Grade I of

*Presented at the 46th Annual Meeting of the Institute of British Foundrymen at Cheltenham.

†The Author is on the staff of the British Cast Iron Research Association.

TABLE III.—*Chemical Composition of Blackheart Malleable Test Bars, and their Mechanical Properties After Anneals A_1 and B_1.*

Melt No.	Chemical composition.					Special treatment.	Anneal A_1		Anneal B_1.	
	T.C, per cent.	Si, per cent.	Mn, per cent.	S, per cent.	P, per cent.		Max. tensile stress, tons per sq. in.	Elongation, per cent on 2 in.	Max. tensile stress, tons per sq. in.	Elongation, per cent, on 2 in.
1	2.60	1.05	0.25	0.043	0.038	None	23.1	8	24.7	11
5	2.33	1.14	0.24	0.043	0.047	Castings air cooled	23.6	8.5	24.7	13
7	2.49	0.92	0.25	0.043	0.048	None	22.8	9	23.6	11.5
10	2.42	0.97	0.29	0.039	0.046	None	23.9	6	24.5	10
14	2.44	0.98	0.26	0.040	0.033	0.07 per cent. Si addition as powdered Si metal	21.9	6.5	27.9	12
15	2.45	0.99	0.25	0.043	0.035	0.21 per cent. Si addition as powdered Si metal	23.6	9	26.5	11
18	2.44	0.96	0.26	0.038	0.042	Cast in sand of high permeability	24.2	8	25.9	13
19	2.40	0.94	0.28	0.039	0.045	Cast in sand of low permeability	23.6	8	27.6	12
20	2.51	0.99	0.25	0.044	0.031	Cast in dry-sand mould	21.3	8.5	25.5	16
21	2.35	0.98	0.28	0.045	0.032	Cast in wet-sand mould*	29.1	7	27.3	11
23	2.36	1.24	0.28	0.033	0.044	0.21 per cent. addition of Si as FeSi	24.2	8.5	26.6	14

* 8 per cent. moisture.

Influence of Heating Rate

B.S.S. 310:1947. By a modification of the annealing cycle only in respect of heating rate, *i.e.*, 45 hours to 930 deg. C. instead of 6 hours, the quality of the same material has been improved to satisfy at least Grade 2 and in several cases to satisfy Grade 3. Relatively rapid heating to the annealing temperature produced temper-carbon aggregates that were large and dispersed, while a slow heating-rate resulted in the formation of more numerous temper-carbon aggregates that were much more compact. By reason of the more numerous temper-carbon aggregates in the Anneal B_1 materials, secondary graphitisation was permitted to proceed more readily and very little pearlite remained in the section. As a result of this the elongation was considerably improved. Furthermore, it would appear that the smaller and more compact type of temper-carbon aggregates contributed to a better tensile strength than did the large dispersed aggregates since the superior tensile strengths of the Anneal-B_1 materials were obtained in spite of there being much less pearlite in them than in the Anneal-A_1 materials.

An important result of an increased number of temper-carbon aggregates was the decrease in the extent of pearlite rim in the Anneal-B_1 bars compared with the Anneal-A_1 bars. Experience has shown that the nature of the atmosphere in which the material is annealed is the principal factor involved in the formation of pearlite rim in blackheart malleable iron. The more oxidising the atmosphere, the deeper is the rim. These experiments have shown that pearlite-rim formation can be offset by increasing the number of temper-carbon aggregates in the edge structure of a section, thereby assisting secondary graphitisation to proceed nearer the edge.

Further Experiments

Convincing results from variations in heating rate for both whiteheart and blackheart materials having been obtained, further experiments were arranged with the intention of determining the range of temperature within which the heating rate affected the number of nodules. and, possibly, to obtain evidence of a convenient preheating treatment that would give equivalent results in this respect.

In one of these experiments, an electric annealing furnace was slowly raised in temperature from 500 to 995 deg. C. during a 45-hr. period. Test-bars used had been prepared from melts of whiteheart composition with a sulphur content balanced by manganese, and of whiteheart composition with excess sulphur. Some ten groups of these test-bars, each group being packed in sand and plumbago and each contained in an annealing pot, were added to the furnace, one group, *i.e.*, one annealing pot, every five hours. Group No. 1 was placed in the cold furnace and heated to 500 deg. C., and five hours later, at a temperature of 555 deg. C., Group No. 2 was added. After Group No. 10 had been added at 995 deg. C., all ten groups were then annealed for 75 hours at 995 deg. C. and then cooled to 650 deg. C. in approximately 40 hours. Micro-specimens were prepared from all the test-bars and nodule counts were made on each. The nodule counts were made in a 0.05 in. zone across the diameter of each 0.564 in. dia. specimen. The heating cycle for each group of bars is shown in the diagram, Fig. 22. The fractures of the Group 1 to 10 test-bars of two of the compositions studied are also shown on the diagram, together with the corresponding results of nodule counting.

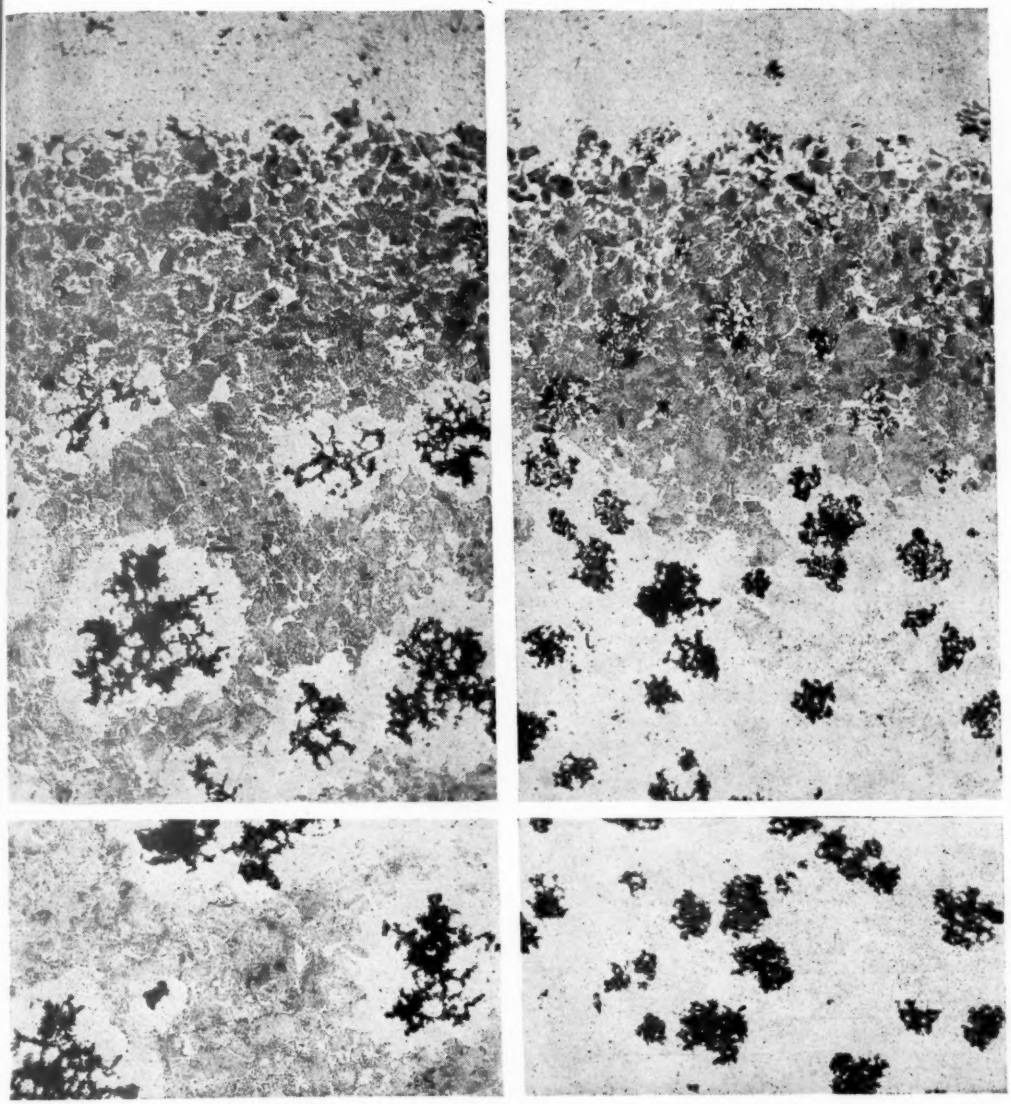
It is clear from this diagram that the Group 1 test-bars contained the most nodules, that the Group 10 test-bars contained the least, and that the number of nodules decreased progressively from Group 1 to Group 10. This decrease occurred mainly between Group 1 and Group 4. Between Groups 5 and 10 the decrease was comparatively slight.

A similar experiment was carried out using test-bars of blackheart composition. This only differed from the previous one in that the temperature of the annealing furnace was raised from 500 to 930 deg. C. in just under 45 hours. Having reached 930 deg. C. this temperature was maintained for 35 hours, then the furnace was cooled to 800 deg. C. in 4 hours and from 800 to 650 deg. C. in 50 hours. Groups of test-bars were added to the furnace at the same time-intervals used in the experiment with whiteheart material. Insufficient time was allowed at 930 deg. C. for all the eutectic cementite to decompose in these materials so that information might be obtained on the influence of nodule number on the rate of eutectic cementite decomposition. Microspecimens were taken from the test-bars of each group, i.e., of Groups 1 to 10, and nodule counting was carried out on each. The results obtained from nodule counting in this experiment are given in Table IV.

The materials annealed in this experiment would normally require about 40 hours' annealing at 930 deg. C. completely to decompose all eutectic cementite. It was intended that the curtailed period of 35 hours at 930 deg. C. should allow some eutectic cementite to remain in some of these test-bars, and this was indeed the case. In the test-bars of Groups 1 and 2 very little cementite remained, but this constituent gradually increased in amount through the series, and in the test-bars of Groups 9 and 10 it was present in an appreciable quantity. Whereas the test-bars of Groups 1 and 2 gave elongation values of 12 and 14 per cent., Groups 9 and 10 gave elongation values of 9 and 9.5 per cent. respectively. The fractures of test-bars representing Groups 1, 2, 9 and 10 are shown in Fig. 23.

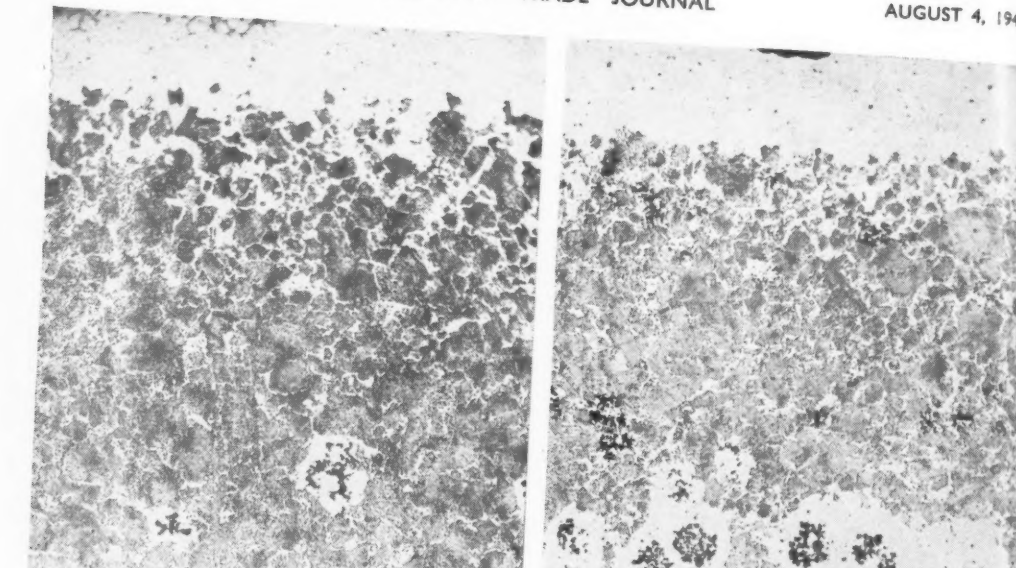
A summary of the results from these further experiments with whiteheart and blackheart irons is given in graphical form in Fig. 24. The graph is plotted showing the number of nodules in a 0.05 in. zone from edge to edge of a 0.564 in. diameter specimen, in relation to the temperature at which test-bars were added to a furnace heating up at a rate of ten or eleven deg. C. per hour. It is apparent from this graph that slow heating through the range 500 to 600 deg. C. has been most effective in increasing the number of nodules in both blackheart and whiteheart materials.

The possibility of a preheating treatment which



Anneal A. Anneal B.

FIG. 18.—STRUCTURES FROM EDGE TO CENTRE OBTAINED FROM MELT NO. 10. Magnification ×60. Etched in 4 per cent. Picral.



Anneal A. Anneal B.

FIG. 19.—STRUCTURES FROM EDGE TO CENTRE OBTAINED FROM MELT NO. 15.
Magnification ×60. Etched in 4 per cent. Picral.

TABLE IV.—*Number of Nodules in Samples of Blackheart Malleable.*

Group No.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Temperature, deg. C., at which added to furnace	500	550	600	650	700	750	800	850	900	930
No. of nodules	1,041	840	489	387	284	272	261	248	272	264

would give a relatively high number of nodules was then investigated. Several melts, some of which had been treated prior to pouring by bubbling hydrogen through them, contributed a group of test-bars which, packed in sand and contained in an annealing pot, was raised from room temperature to 300 deg. C. at the maximum heating rate and then maintained at 300 deg. C. for 12 hours. The bars were then heated to 990 deg. C. at maximum heating rate and annealed at this temperature for 75 hours. They were then slowly cooled and microspecimens were taken from each test-bar. This procedure was repeated with 12-hour pre-heating treatments at 400, 500, 600 and 700 deg. C. Nodule counts were made on the microspecimens so obtained and the results are given in Table V.

These preliminary results indicate that a temperature of 400 deg. C. might prove to be the most suitable preheating temperature for increasing the number of nodules, especially for blackheart iron. It is evident that the preheating effect on nodule number is accentuated in material which has been previously treated with hydrogen. This observation is in keeping with those made by Lorig and Samuels.[2]

Discussion of Results and Conclusions

It has been shown in this Paper that the rate at which white iron castings are heated to the annealing temperature considerably affects the process of graphitisation during annealing. This effect is continued throughout the remainder of an annealing cycle and results in a marked variation in the microstructure of the annealed product. It is evident that within certain limits the more rapid the rate of heating the fewer and larger are the resulting temper-carbon nodules. In this Paper the limits of the rate of heating within which the effect is discernible have not definitely been established but a rate of heating of ten deg. C. per hour (45 hours from 500 to 930 or 1,000 deg. C.) gave numerous small nodules, whilst rates of heating of 40 to 70 deg. C. per hour gave fewer and much larger nodules. The more numerous small nodules produced by the slower rates of heating are relatively compact, whilst the larger and less numerous nodules produced by rapid rates of heating tend to be aggregates of dispersed graphite.

Experimental evidence has been given which suggests that the treatment resulting in the formation of many small nodules is connected with a slow rate of heating through the temperature range 400 to 600 deg. C. or with the holding of the material before annealing at a temperature within this range. Slow rates of heating commencing at 600 deg. C. and proceeding to 1000 deg. C. apparently have no such effect. This applies both to the blackheart type of iron which graphitises rapidly and to the whiteheart irons which, in general, graphitise much more slowly.

It is well known that, for an iron of a given composition annealed at a given temperature, the rate of cementite decomposition is related to the number of temper-carbon nodules formed. The larger the number of nodules the more rapidly does the reaction proceed. This has been shown by previous investigators[3,4] and is well established, particularly for blackheart material. The work of Boegehold[4] illustrated the effect of heating rate on the temper carbon nodule number in blackheart iron. The experiments described in this Paper have confirmed that those materials containing large numbers of temper-carbon nodules have annealed more readily than those which, by reason of their having received a rapid heating rate to their annealing temperature, have contained a limited number of large nodules.

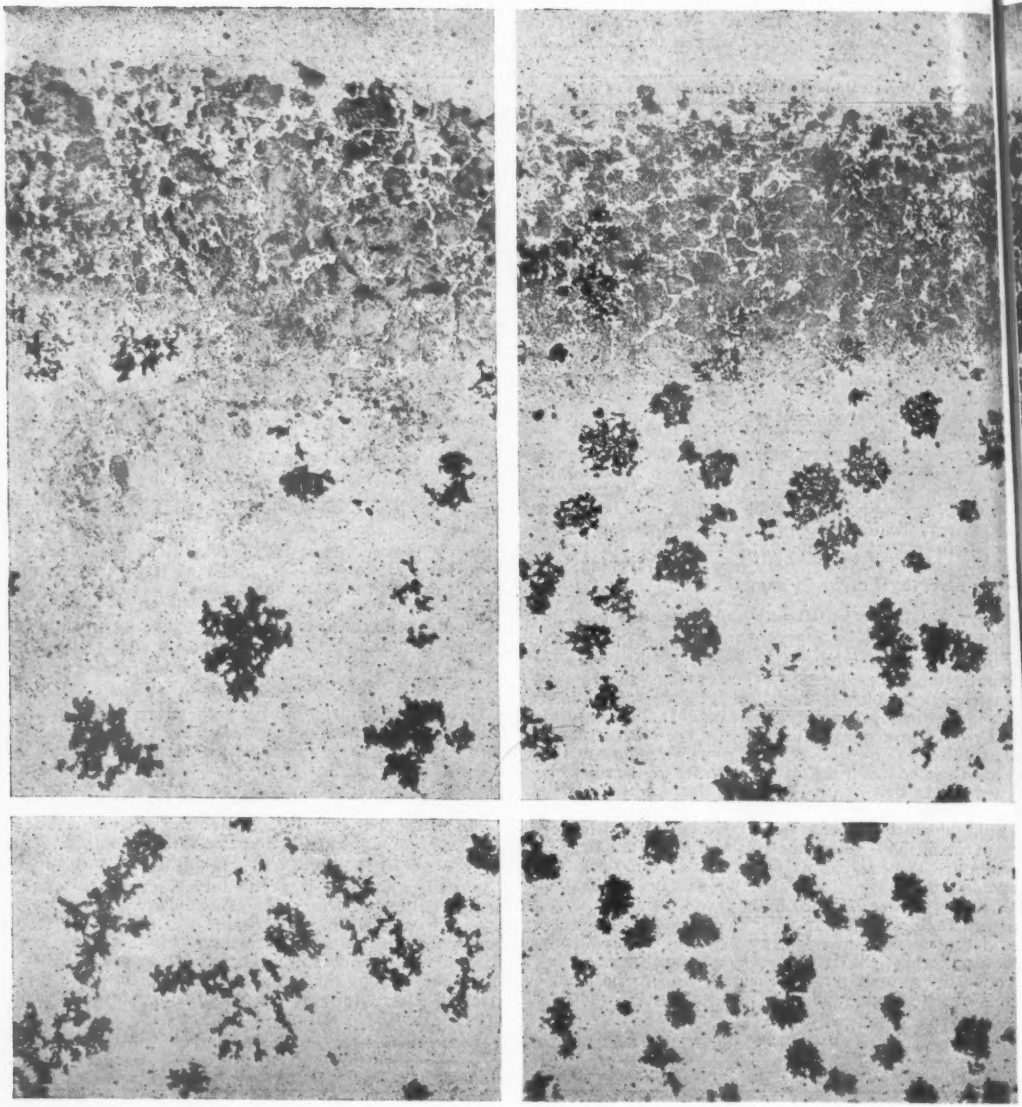
For Whiteheart Annealing

Throughout the wide range of chemical compositions that have been used in these experiments to represent whiteheart iron it is apparent that all have responded in a similar manner to variations in heating rate. Thus, irrespective of silicon content and the sulphur to manganese ratio, a rapid rate of heating, in general, gave a limited number of large nodules and a slow heating rate gave an appreciable increase in the number of nodules, the size of these being much smaller.

When a whiteheart iron has a high manganese content or a high sulphur content especially in conjunction with a low silicon content, the danger of the persistence of eutectic cementite in the annealed material is considerable. Therefore, with all other conditions being the same, embrittlement of the annealed material by un-decomposed cementite tends

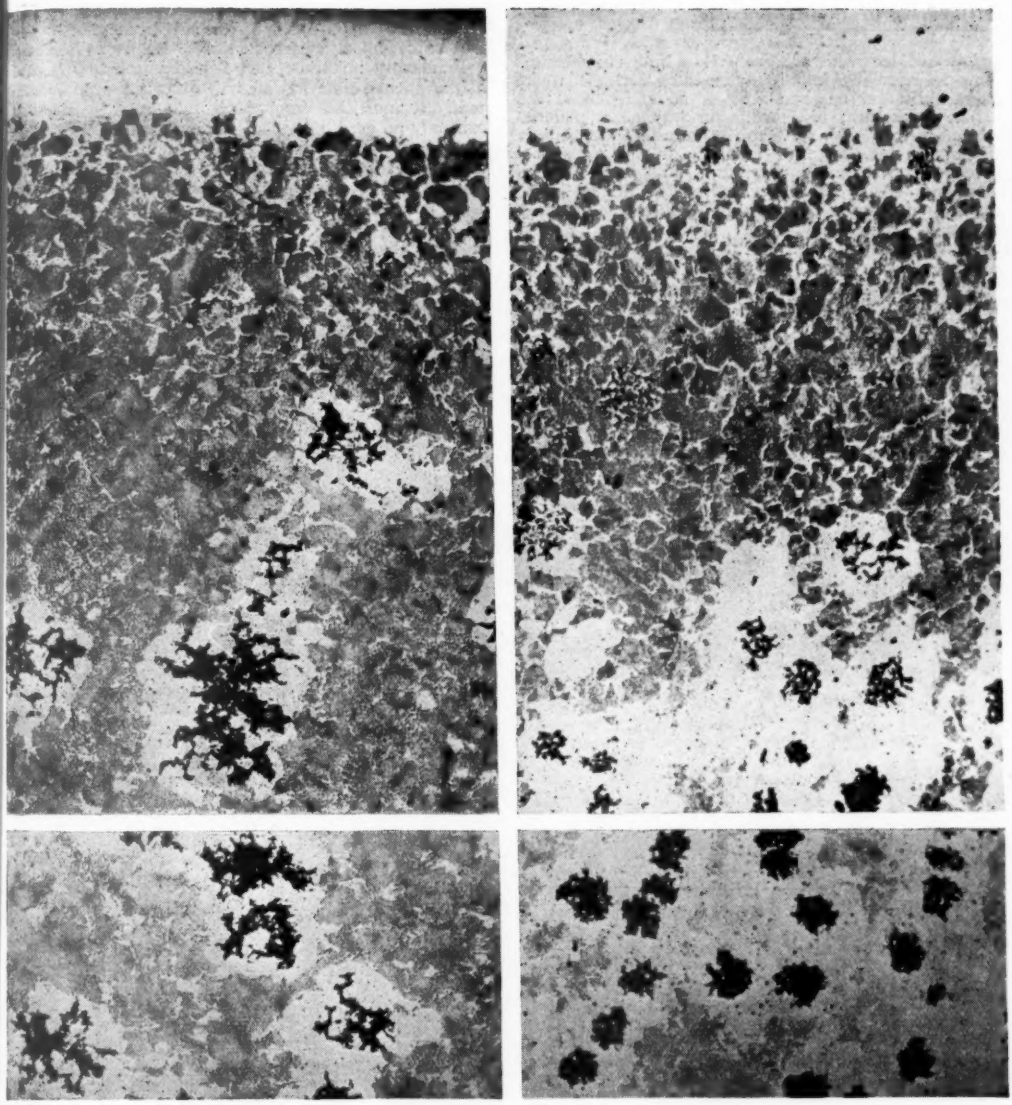
TABLE V.—*Nodule Counts Related to Gas-treated Samples and Others Pre-treated at Increasing Temperatures.*

	300 deg. C.	400 deg. C.	500 deg. C.	600 deg. C.	700 deg. C.
Whiteheart (excess S)	63	132	42	102	50
" (excess S) + hydrogen	57	146	64	103	37
" (excess Mn)	117	137	109	197	59
" (excess Mn) + hydrogen	73	299	77	307	60
Blackheart	677	779	596	597	511
" + hydrogen	1,374	2,297	1,490	1,203	540



Anneal A. Anneal B.

FIG. 20.—STRUCTURES FROM EDGE TO CENTRE OBTAINED FROM MELT No. 20.
Magnification ×60. Etched in 4 per cent. Picral.



Anneal A. Anneal B.

FIG. 21.—STRUCTURES FROM EDGE TO CENTRE OBTAINED FROM MELT NO. 21.
Magnification ×60. Etched in 4 per cent. Picral.

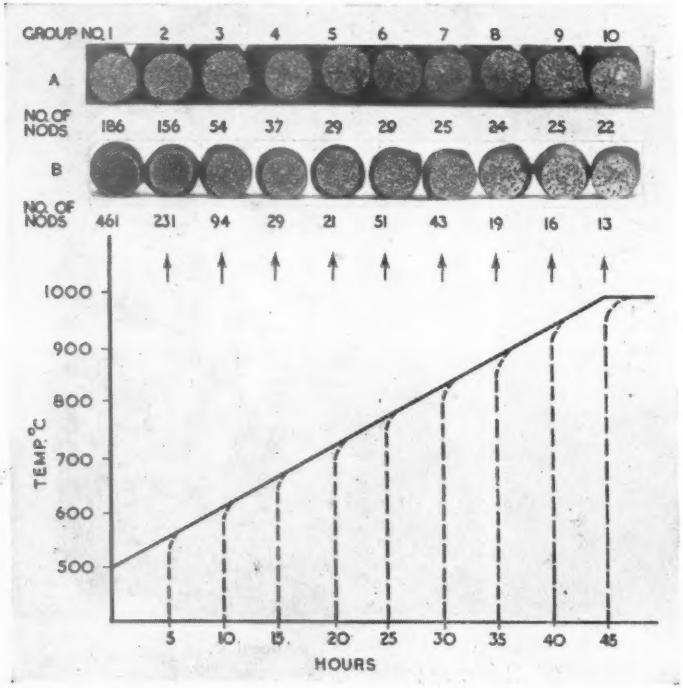
Influence of Heating Rate

to be avoided with relatively slow rates of heating. This is especially important in thick sections where de-carburisation has had little or no effect.

The mechanical test results on whiteheart material quoted in this Paper serve to illustrate that the number of nodules has very little influence on the mechanical properties, provided graphitisation is complete. The best mechanical properties, however, can be more readily developed from compositions containing a small excess manganese content with respect to the sulphur content. It is only in this type of iron that an increased nodule number appears to be of any benefit to mechanical properties. Such material has been shown to permit secondary graphitisation during cooling and an increase in the number of nodules assists in furthering this process with the result that appreciable amounts of ferrite can be formed and these give increased ductility. This observation may be of particular importance when considering sections in which de-carburisation has been insufficient to reduce the carbon content of the matrix below the eutectoid carbon content. When secondary graphitisation during the cooling of whiteheart iron is obtained, the danger of the occurrence of hypereutectoid cementite is reduced.

Practically no whiteheart iron being manufactured at the present time has a small excess manganese content. It must be emphasised that such a material can only be used, provided that rigid control of carbon and silicon content is maintained in order to prevent the occurrence of primary graphite in the white-iron castings. For the majority of whiteheart foundries, using conventional cupola melting in the manufacture of castings having a wide variation in section, the most suitable chemical composition appears to be one having a sulphur to manganese ratio between 0.6 and 0.8. Good mechanical properties can be developed from such material by efficient de-carburisation.

Confirmation has been obtained of the observations made in the previous paper with respect to the influence of the sulphur to manganese ratio in whiteheart malleable iron. It is interesting to note that the gradual change from the aggregate type of temper-carbon nodule to the spherulitic type with increasing sulphur content has applied whether the general nodule size has



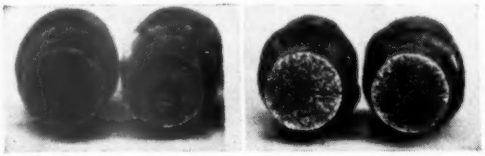
A = Whiteheart (excess S).
B = Whiteheart (excess Mn).

FIG. 22.—HEATING CYCLE FOR EACH GROUP OF BARS 1 TO 10, TOGETHER WITH FRACTURES AND RESULTS OF NODULE COUNTING.

been large or small. It must be appreciated that any effect the sulphur to manganese ratio or the nodule number may exert on the structure in a particular section may be completely eliminated if de-carburisation is allowed to proceed far enough.

For Blackheart Annealing

It will be readily appreciated that the observations made on the effect of heating rate are primarily of importance to the annealing of blackheart malleable iron. It would appear that the heating rate applied to



1 2 9 10

FIG. 23.—FRACTURES OF TEST-BARS FOR THE GROUPS SHOWN.

blackheart iron annealing is of such importance that it can mean the difference between a poor and a good quality material. Thus, even with excellent melting and casting practice and rigidly controlled metal composition, it is still possible to obtain an inferior product merely by employing a too-rapid rate of heating to the annealing temperature.

It has been shown that blackheart materials are very sensitive to variations in the rate of heating to the annealing temperature. Whereas a rapid heating rate leads to the occurrence of a relatively small number of large dispersed aggregates and produces material which is difficult to anneal, particularly during the second-stage period, a slow rate of heating results in the formation of numerous small compact aggregates to give material in which eutectic cementite decomposition proceeds readily and in which secondary

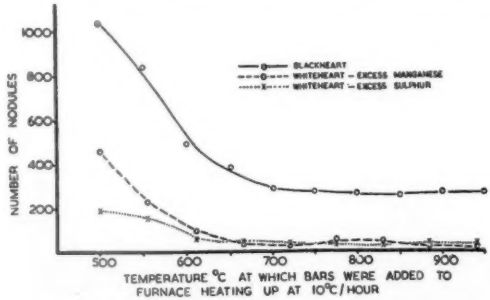


FIG. 24.—GRAPHICAL SUMMARY OF THE RESULTS OF FURTHER EXPERIMENTS WITH WHITEHEART AND BLACKHEART IRONS.

graphitisation during the second-stage portion of the anneal is achieved without difficulty.

These two types of matreial, *i.e.*, the one obtained from rapid rates of heating and the other from slow rates of heating, have been shown to be distinctly different in their mechanical properties. The material containing large dispersed temper-carbon aggregates together with appreciable amounts of pearlite, by reason of incomplete secondary graphitisation, has been shown to be inferior both in tensile strength and in elongation when compared with the materials which contained numerous and comparatively small compact aggregates and practically no pearlite at the centre of the section. Since the more pearlitic material would normally be expected to have a higher tensile strength, it appears that the form of the temper carbon contributes to a difference in tensile strength, the dispersed type of aggregate in general giving the lower strength.

It is very evident from these observations that a distribution of numerous small temper-carbon aggregates in blackheart malleable iron is to be desired. If, therefore, blackheart iron is to be annealed in an annealing furnace capacable of rapid rates of heating, it would then appear essential to incorporate a slow rate of heating through the temperature range 400 to 600 deg. C. As indicated by the preliminary results on pre-heating treatment reported in this Paper, a comparatively short period of pre-heating at a temperature in the region of 400 deg. C. may prove to be a suitable alternative to slow heating. If blackheart castings are raised to the annealing temperature rapidly, then subsequent first-stage and second-stage graphitisation will be impeded by the poor graphite-nodule distribution and, indeed, complete secondary graphitisation may be impossible to obtain within a reasonable annealing time.

Perhaps the most usual difficulty encountered in the annealing of blackheart malleable iron is incomplete secondary graphitisation which gives unwanted pearlite in the structure. Should this occur in material containing a suitable temper-carbon aggregate distribution, *i.e.*, numerous medium- to small-sized aggregates, then a remedy must be sought in either lengthening the cooling treatment or correcting the chemical composition. On the other hand, however, if it be found that the material giving trouble contains a poor distribution of temper carbon, *i.e.*, a limited number of large dispersed aggregates, then correction of incomplete secondary graphitisation may be achieved if a slower rate of heating to the annealing temperature be adopted.

Of course, it is known, and has been shown,[1] that a small addition of aluminium to a blackheart iron melt immediately before pouring considerably increases the number of nodules in the resulting annealed material. The increase is comparable in amount with that obtained from the use of a slow rate of heating. Preliminary work by the Author has indicated that blackheart iron treated with a small addition of aluminium may be less susceptible to the effect of heating rate than is the untreated material.

Another frequent cause of trouble in the annealing

of blackheart iron is the occurrence of pearlite rim. This occurrence is known to be primarily a result of the annealing of the material in an oxidising atmosphere. The more oxidising the atmosphere the deeper, usually, is the pearlite rim. If, however, annealing practice can be arranged to give a temper-carbon distribution consisting of numerous small nodules, these occurring to within a short distance from the edge, then, as shown by the results quoted and illustrated in this Paper, the depth of the pearlite rim can be reduced. This is because secondary graphitisation in the structure near the edge of the section is then assisted by the presence of a suitable number of centres upon which this graphitisation can proceed.

No attempt has been made in this Paper to explain the phenomenon of an increase in the number of nodules resulting from a slow heating treatment or a pre-heating treatment within the temperature range 400 to 600 deg. C. This subject forms only a part of the research work proceeding in the laboratories of the British Cast Iron Research Association with a view to investigating the mechanism of graphite formation during the annealing of white cast iron. It is appreciated that further work is required on pre-heating treatment and the effect on the total annealing time that such a treatment may have.

The Author is indebted to the Director and Council of the Association for permission to publish this Paper, and to Mr. H. Morrogh, the Research Manager, for his continued advice and encouragement. He wishes to acknowledge also the indispensable contribution made to the Paper by the chemical, metallographic and mechanical testing laboratories of the Association.

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2 Lorig and Samuels, Trans.A.F.A., 1942.
3 Schwartz and Barnett, Trans. A.S.M., 1939, p. 570.
4 Boegehold, Trans. A.F.A., 1938.

The carrier is machined from a phosphor-bronze casting and incorporates a thick liner of copper-tungsten Elkonite, which has a very high coefficient of absorption of radiation. The radium source, in a platinum container, is held at the centre of the carrier by a clip mounted upon an Elkonite rod. Extraction of the radium is easily achieved when required. In making single exposures, the portable carrier may be mounted upon a mobile stand, for which an accessory device for accurate sighting is manufactured. The design of the carrier is such that upon the removal of one of the conical plugs a uni-directional radiation beam of fairly narrow angle is released. After the sighting device has been used to bring radium source, carrier orifice and object exactly into line, the conical plug is removed and the exposure made.

Panoramic exposures, by means of which the radiography of 40 or more castings may be carried out simultaneously, are made by combining the portable carrier with a time-controlled exposure unit. This, essentially, is a small motor-driven lifting device, which may be set to operate at a certain time up to seven days in advance, to make an exposure of predetermined duration.

Equipment for Handling Radium Sources

Gamma-ray radiography is now firmly established in industry as a method of inspecting castings, and suitable radium or radon sources are now obtainable from the Government-owned Radiochemical Centre at Amersham, as described in the JOURNAL dated June 9.

Particular attention has necessarily been given to the question of safety and to devising methods of reducing to the very minimum the amount of radiation to which the operator is exposed. As a result of the experience gained in this work, a number of special items of equipment have been designed which have proved efficient and, at the same time, simple to operate. Arrangements have now been made by Johnson, Matthey & Company, Limited, to manufacture these so that they may be generally available. Instructions may thus be given to the Radiochemical Centre for sources to be sent to the Johnson Matthey laboratories at Wembley for fitting into approved carriers. In this way the user avoids the major risks associated with the handling of unscreened radioactive materials.

The bulk of industrial radiography is carried out by means of 100- to 250-mgm. radium sources, whose use demands every possible precaution. To house these sources a standard portable carrier (Fig. 1) has been devised, suitable for both the storage and transport of the radium. It weighs only 38 lb. and can thus be handled with ease by one man. The protection given by this equipment is extremely good and, at a distance of three feet from a carrier containing a 250-mgm. source, the radiation is less than 0.2 röntgen per day—well below the accepted tolerance dose. This carrier can also be used to house radon or other gamma-ray sources up to a value of 250 millicuries.

(*Continued at foot of col.* 1.)

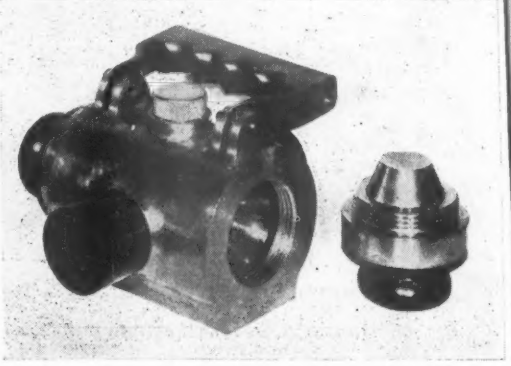

FIG. 1.—STANDARD PORTABLE CARRIER.

Production of Metallurgical Coke*

Modern Trends Related to Cupola Practice

By M. D. Edington †

The manufacture of coke can be conveniently dealt with under three headings, (*a*) the supply of suitable coal, (*b*) the coking process, (*c*) the future of metallurgical coke.

Coke production commences at the coal face, the quality of the coke being largely determined by the type of coal available. Coal varies greatly in its coking properties and over half the coal produced in this country, whilst of excellent quality for industrial and domestic use, is unsuitable for conversion into coke on account of low caking power. How is it possible to determine whether a particular coal will make a satisfactory coke? When coal is heated the gases and volatile hydrocarbons are driven off, leaving a more or less coherent residue, and by carrying out tests under standard conditions (BS. 1016-1942) for volatile content and by examination of the residual coke, the coal can be classified and its coke-making value accurately assessed. For the sake of convenience, code numbers based on the volatile content and coke type have been adopted by the Fuel Research Board and will be used in this Paper, a summary of the main types of interest to the coke producer being shown in Table 1.

TABLE I.—*Code Numbers Related to Coal Types.*

Fuel Research Code No.	Type of coal		Volatile matter (dry, ash free)
			Per cent.
201/205	Low volatile	Steam and coking coals (S. Wales)	10-20
301 ..	Medium volatile	Prime coking coals .. (Durham and S. Wales)	20-30
401/402	High volatile (very strongly caking)	Coking and coking gas (Durham and S. Wales)	Above 30
501/502	High volatile (less strongly caking)	Gas coals (Durham and Yorkshire)	" "

Choice of Coal for Coke Making

In general, the value for coke making is at a maximum when the volatile content of the coal is between 20 and 30 per cent., the high-grade foundry cokes being obtained almost entirely from the 301-type prime coking coals (20 to 30 per cent. Volatile Matter) of Durham and South Wales. Both the 301 and 401 coals of Durham and South Wales and the higher volatile 501 coal of Yorkshire are utilised for the production of furnace and general metallurgical coke, the gas coals of Durham being mainly absorbed by the London and South Coast gasworks. The estimated reserves and projected annual outputs of coking coals are indicated in Table II[1].

TABLE II.—*Reserves and Annual Outputs of Coking Coals.* (Figures in millions of tons.)

Coal type		England and Wales	Durham	Other coalfields (principal producers)
301	Reserves	1,183	250	S. Wales 767 Kent .. 115
	Output ..	15.9	5.0	9.8 0.7
401	Reserves	1,735	1,091	S. Wales 355 N. Staffs. 113
	Output	24.0	16.7	4.4 0.2
501	Reserves	1,773	624	S. Yorks 656 W. Yorks 143
	Output	21.3	7.5	7.5 2.0

Fortunately the best coking seams are usually low in ash, sulphur and phosphorus, but they are often thin and difficult to work without appreciable contamination. The inclusion in the coal from an 18-in. seam of 2 in. of shale from a dirt band, or from the roof or floor, would increase the inherent ash content from 2 per cent. in the seam itself to 10 per cent. in the run-of-mine coal obtained from that seam, whereas in the case of a seam 5 ft. in thickness such an inclusion would only increase the ash from 2 to 4 per cent. In the past, coal could be carbonised practically as-mined, so that it was not too difficult in the "beehive" days to put on the market coke with an ash content of 5 per cent. To-day such coals are not available and it is essential that all coal used for cok-

TABLE III.—*Float and Sink Tests on Two Coals at Various Specific Gravities.*

Run-of-mine coal		"Y"		"B"	
		Per cent.	Per cent. ash	Per cent.	Per cent. ash
Floats	1.30 ..	44.6	2.1	38.0	2.6
	1.30–1.40 ..	33.2	6.3	21.5	5.7
Floats	1.40 ..	77.8	3.9	59.5	3.7
	1.40–1.50 ..	5.7	15.5	15.2	17.4
Floats	1.50 ..	83.5	4.7	72.7	5.8
	1.50–1.60 ..	3.1	26.7	20.0	25.1
Floats	1.60 ..	86.6	5.5	92.7	9.3
Sinks	1.60 ..	14.4	73.3	7.3	80.0
Total coal	..	100.0	15.3	100.0	14.5

*Presented at the 46th Annual Meeting of the Institute of British Foundrymen.

†Chairman of the Coke Oven Managers' Association (Northern Section).

Production of Metallurgical Coke

ing should be washed or otherwise cleaned if a reasonably low ash content in the coke is to be maintained.

Coal Preparation Methods

Modern coal preparation plant has been, and is being installed and in some instances has been placed under the supervision of the coke-oven manager, but seams are now having to be worked which, though possessing excellent coking properties, are difficult to clean. In order to produce coke with less than 8 per cent. ash, the ash in the coal must not exceed 6 per cent. and Table III shows a "float and sink" test at various specific gravities on two first-class coking coals which require somewhat different treatment before they can be carbonised.

Both require to be washed, but with "Y" the removal of 14.4 per cent. of heavy stone is sufficient to give a clean product and it can be adequately dealt with in a Baum wash box (Fig. 1). In this washer, compressed air imparts a pulsating motion to the water causing it to rise and fall through a perforated screen, the clean coal being carried forward by a flow of water and the bottom shale layer being removed by rotary extractors at each end of the box.

Coal "B" contains approximately 35 per cent. of shale and intergrown coal and shale and requires a "gravity" separation in a special bath consisting of a mixture of barytes, or such another heavy finely-divided mineral, with the water. To clean this coal down to the required standard, 27.3 per cent. of the original raw coal has to be discarded, some of it as a comparatively low-ash product which could only be used for steam raising on specially designed grates.

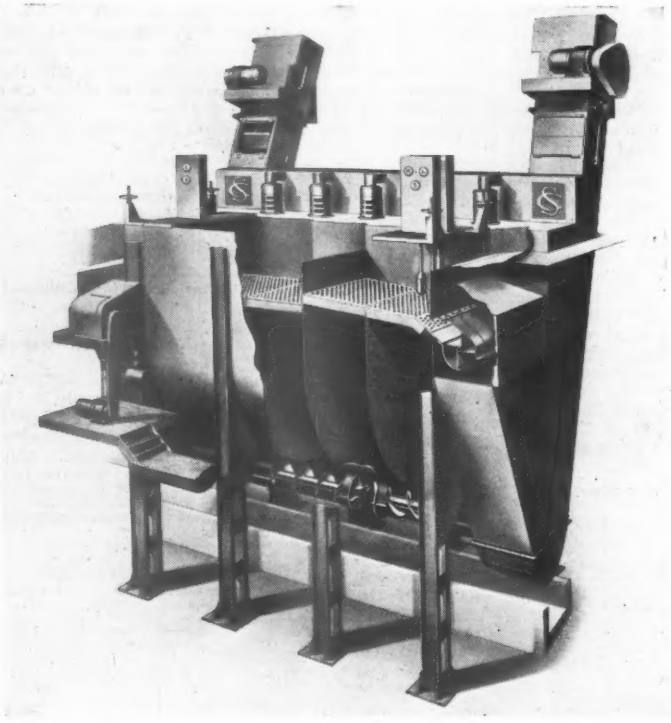

FIG. 1.—BAUM COAL WASHING BOX. *[Courtesy of Simon-Carves, Limited]*

With both the Baum and heavy medium washers, additional equipment in the form of froth flotation and filtration plant is necessary for recovering and cleaning fine coal. After washing, the coal for carbonisation is de-watered, either in drainage bunkers or by means of centrifuges, preparatory to blending and crushing.

In the important Midland coalfield where there is considerable variation in coking properties due to the presence of durain or dull coal, elaborate blending arrangements consisting of sidings and bunkers are often necessary, particularly at the steelworks' ovens taking supplies from many different sources. In South Wales, careful blending of low and high volatile coal is required to prevent damage to ovens from the highly swelling coals in that area. In Durham, where coking quality is more uniform, blending is not so important, except when mixtures of dry-cleaned and washed coal are used, but some alteration in procedure may have to be made as the prime coking-coal reserves become exhausted and more of the poorer coking types have to be used. The strongly caking coals are sensitive to variation in oven temperature and yield a rather inferior coke when carbonised in narrow ovens at fast rates, but by the addition of an inert material such as coke breeze, the coking time can be reduced and a tough dense coke can still be produced.

Addition of Coke Breeze

It should be emphasised that the use of breeze in this way is not a means of getting rid of an undesir-

able product, but can be likened to the beneficial effect of the addition of sand to a neat cement mix.

Table IV shows the results obtained over an extended period from the addition of 4 per cent. of breeze to a West Durham coking coal.

TABLE IV.—*Influence on the Resultant Coke of Coke Breeze Additions to the Coal.*

	With 4 per cent. coke breeze	Without breeze
Width of oven	20½ in.	20½ in.
Run-of-oven coke—		
Grading, above 8 in. ..	11.0 per cent.	2.7 per cent.
„ 6 in. ..	37.9 „	18.1 „
„ 4 in. ..	76.8 „	54.8 „
below 4 in. ..	23.2 „	45.2 „
Shatter index, 2 in./1½ in. ..	88/94	86/93

burning waste-heat ovens to the high-capacity regenerative ovens which operate on short coking times. Due to the shortage of refractory and other materials, a number of veteran plants may have to be kept going longer than was expected, but their replacement by modern units can only be a matter of time.

TABLE V.—*Types of Ovens in use.*

Type of oven	1937		1947	
	No. of ovens	Coal carbonised (thousand tons)	No. of ovens	Coal carbonised (thousand tons)
Beehive and non-recovery	837	456	238	100
Waste heat	1,919	4,024	1,025	2,080
Regenerative	4,224	17,431	3,625	17,630

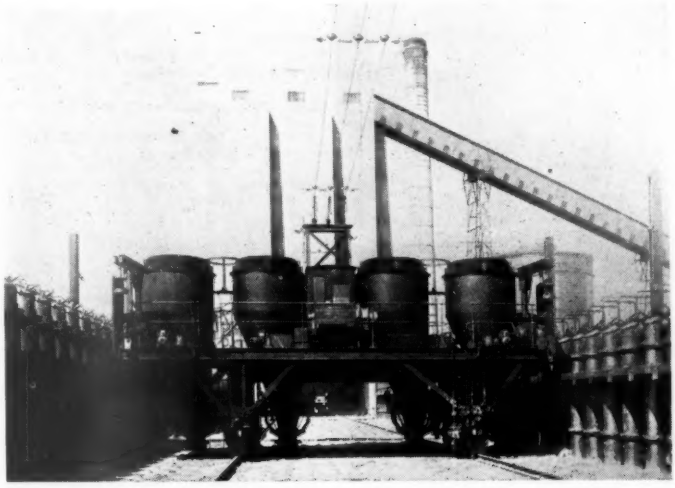

FIG. 2.—COAL CHARGING CAR.
[Courtesy of Wellman Smith Owen Engineering Corporation, Limited]

The coke breeze is crushed in rod mills as far as possible to pass 1-mm. sieve and is then carefully blended with washed coal, the mixture being finally crushed in pulverisers, usually of the swing-hammer type, to a fineness of 70 per cent. below ¼-in. mesh for furnace coke or 90 per cent below ¼-in. mesh for foundry coke. The proportion of breeze and the degree of crushing of both coal and breeze necessary to produce good coke depends on the class of coal and also on its ash content.

Development of Ovens

It is not proposed to refer in great detail to the historical development of the by-product oven; Table V[2] shows the significant reduction during the past ten years in the number of beehive ovens and also the continued change-over from the older type of slow-

The effect of this change in coke-oven practice is of particular importance to foundry-coke users and will be discussed later.

In the beehive oven, four tons of coal in a layer two feet thick were coked in 72 hours by the downward heat from the burning gases in the oven, the deposition of graphite from the gases ascending through the coke and the quenching inside the oven giving the beehive coke its well-known structure and silvery appearance. The first battery of by-product ovens in Great Britain was built in Durham in 1882 and is still making foundry coke. Briefly, the by-product oven is a rectangular brick chamber, heated from both sides, which results in a central cleavage in the oven charge so that the coke is short and blocky and in pieces of less than 10 in. long compared with pieces up to 20 in. long produced in the beehive oven. The ovens are fitted with removable doors and have

Production of Metallurgical Coke

a slight taper to facilitate discharge of the coke by means of a ramming machine. Coal is loaded through holes in the oven tops and the gases are led off through ascension pipes and collecting mains. Part of the gas, after the removal of by-products, is returned to the heating flues at each side of the oven chamber.

The older ovens were constructed in semi-silica brick, the average dimensions being 33 ft. long, 8 ft. high, 21 in. wide, with a coal charge of 8 tons and a coking time of 30 to 32 hours. With the waste-heat system, at least 80 per cent. of the gas made is needed for heating the ovens, cold air being used for combustion, the burnt gases leaving the heating flues at 1150 deg. C. and being later used for steam raising. The coke is generally pushed through a quenching hood on to a sloping bench and is loaded by means of a conveyor over a screen into wagons.

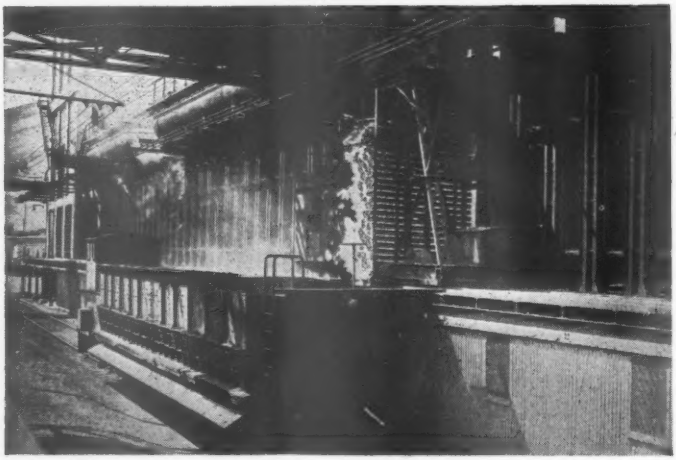

FIG. 3.—COKE BEING DISCHARGED FROM THE OVEN.

[Courtesy of Woodall-Duckham Company, Limited.]

Regenerative Ovens

The modern regenerative oven is constructed in silica brick and operates with a flue temperature of 1150 to 1200 deg. C. for foundry coke and 1250 to 1350 deg. C. for furnace coke. The usual dimensions are 38 ft. to 40 ft. long, 12 ft. 6 in. to 14 ft. 6 in. high and 18 in. wide, the coal charge being 15 to 16 tons and the normal burning time 18 to 24 hours, although this may be extended to 30 hours where foundry coke is required. Under each oven there are one or more regenerators filled with chequer brick-work, one being heated by the outgoing burnt gases and the other preheating the incoming air, the flow being reversed every 20 to 30 minutes. As a proportion of the outgoing heat is recoverable by the incoming air for combustion, only 40 to 50 per cent. of the total gas made is required for heating the ovens, the remainder being surplus and available for other uses. Blast-furnace or producer gas can be used entirely, or in part, for oven heating, additional regenerators being necessary for heating the lean gas. The "Underjet" system is now standard practice, the oven masonry being built on a reinforced concrete substructure to form a basement in which the fuel gas mains and burner pipes are accessible for inspection and adjustment.

The operation of loading and discharging an oven consists of filling an electrically-driven charging car (see Fig. 2) with coal from the oven service bunker and, after weighing, the coal is emptied into the oven through four charging holes. With finely crushed coal, as used for making foundry coke, mechanical pokers are often required to loosen the coal in the charging-car hoppers. The gas evolved during loading is drawn from the oven into the collecting main by a steam jet which is shut off as soon as the charge has been levelled by means of the leveller bar attached to the ram or pusher machine and after the charging-hole lids have been put on.

When carbonisation is completed, the doors, which may be of either the luted or the self-sealing type, are removed by electrically-operated door extractors and the coke is pushed out through a guide into a coke car (Fig. 3) the operation taking less than 60 secs. The hot coke is quenched at a central quenching station for a definite period, usually 45 secs., and the moisture content of the coke can thus be maintained within very narrow limits. After cooling, the coke is dropped on to a sloping wharf, is taken by belt conveyor to the screens and is there graded to over 4 in. size for foundry and 2 in. size for furnace coke.

Interlocking and other safety devices, including those using infra-red rays, are fitted to the various machines. Gas pressures, draught suction and temperatures are automatically controlled so that the ovens work to a regular schedule day after day and turn out a remarkably even and uniform product.

Production Figures

The latest figures (1947) for hard coke disposals and the tonnages of foundry coke supplied by the various districts are given in Table VI.

What of the Future?

Ignoring problematical applications of atomic energy and fluidised heat, it would appear that the coal reserves of reasonable quality are theoretically adequate to maintain the supply of coke for a further half century, although it is probable that the output of metallurgical coke may be temporarily affected by the gap in the building of new ovens during the past few years. The output of foundry coke has tended to

TABLE VI.—*Coke Disposals and Output by Districts.*

Coke disposals—	Tons	Per cent. of total
Blast furnaces	8,605,300	62.0
Foundries	1,057,200	7.6
Export	23,700	0.2
Industrial and domestic	4,183,800	30.2
	13,870,000	100.0
Foundry coke output—	**Tons**	**Per cent.**
Durham	622,700	58.9
S. Wales	225,000	21.3
Scotland	93,200	8.8
Yorkshire	65,800	6.2
Lancashire	45,800	4·3
Other districts	4,700	0.5
	1,057,200	100.0

increase, but, as previously mentioned, this class of coke is produced almost entirely from the 301 coals of Durham and South Wales, where the mining losses are heavy, and it can be assumed that the cost of extracting the prime coking coals, with their thin seams and scattered and diminishing reserves, is considerably above the average for these two districts. It is probable, therefore, that other coals, less costly to mine, may have to be used in increasing quantities for the

TABLE VII.—*Results Obtained from Four Plants.*

Plant	A	B	C	D
Mean oven width, in inches	20½	20½	20½	17¾
Coking time, in hours	48	32	29	22
Flue temp., deg. C.	1,020	1,100	1,170	1,195
Run-of-oven coke (before screening), percentage—				
Retained on 8 in. mesh	30	11		
" 6 in. "	60	38	11	19
" 4 in. "	86	77	61	39
Below 4 in. mesh	14	23	39	61
Shatter test, 2 in. to 1½ in.	89/96	88/94	86/93	84/91

manufacture of foundry coke. The other important factor is the type of oven. Table VII shows the results being obtained at four well-known foundry-coke plants all using prime coking coals with 28 to 29 per cent. volatile matter.

The coke made at each of the four plants in Table VII is of excellent quality, that from plant "A" contains an appreciable proportion of bed coke, 8 to 10 in. size, but production at this plant is uneconomic and can be expected to cease at an early date. The cokes from plants "C" and "D" are smaller, but have a uniform size range and are giving good results. The effect on size of the higher temperature and the narrower oven should be noted and the best width and coking period for the new coke-oven installations, to be built in place of the older foundry coke ovens, is of the utmost importance to both the producer and the consumer. The capital cost of these new plants is so great that the highest possible throughputs are essential and the production of large-size coke at slow rates and from special coals is uneconomic at present prices.

Under these circumstances the foundry user will be required to accept a smaller type of coke and alterations may have to be made in cupola design and practice. The only alternative seems to be an early and substantial increase in the price of large foundry coke.

Experiments should, therefore, be carried out on large-scale cupola practice with the object of using smaller coke and, if this can be achieved, it will mean greater throughput at the coke ovens and cheaper coke at the foundries.

The Author wishes to thank the National Coal Board for permission to publish this Paper and also his colleagues in the Carbonisation Division who have supplied the data used.

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Death of Mr. F. P. Wilson

We regret to record the death of Mr. F. P. Wilson, J.P., K.St.J., a Past-President of the Institute of British Foundrymen, which took place last Thursday. Mr. Wilson, who was educated at the Middlesbrough High School and the Giggleswick Grammar School, learnt his trade as an engineering apprentice at the Tees-side Engine Works of R. Stephenson & Company. Later he became foundry manager to Pease & Partners, Limited. Much of his life was spent in the service of the public. Middlesbrough Education Committee, the Y.M.C.A., the North Riding Infirmary, and especially St. John Ambulance Brigade, all benefited from his enthusiastic co-operation and wise counsel. On the technical side, he presided with distinction over the Cleveland Scientific and Technical Institute, was a founder of the Constantine Technical College and of the Middlesbrough Branch of the Institute of British Foundrymen. He presided over the Institute in 1930, and will always be remembered as a witty speaker and a competent and sympathetic chairman. Mr. Wilson was 79 years old at the time of his death; a memorial service was held last Saturday at St. George's Congregational Church, Middlesbrough.

New Ovens for Foundry Coke

Coppee Extensions in South Wales

An assembly of prominent men in the Welsh mining industry was convened last week by the Coppée Company (Great Britain), Limited, to witness the formal putting into operation of a battery of new foundry coke ovens, which the company has just completed for the National Coal Board at Coedely Colliery, near Tonyrefail, Glamorgan.

The new ovens, 20 in number, form the first section of a major programme of extensions at the colliery. They are in the same line as 30 existing ovens, which were first built by the Coppée Company in 1914 and rebuilt in 1935. These ovens have always specialised in producing high-grade, large-size foundry coke, and it is intended to make no change in coking arrangements.

Special Features Retained

Although the ovens are the first to be completely built since the vesting date of the National Coal Board, it is interesting to find that the original extension scheme was envisaged by the late owners, the Welsh Navigation Steam Coal Company, Limited, and that Mr. F. Llewellyn Jacob, chairman of that company, was present at last week's ceremony. Because of the need for the new ovens to produce special foundry coke, their design does not conform entirely with present trends; the chamber width (21 in. mean) is greater and its height (8 ft. 8 in.) is less than those now current. This means that the existing method of using compressed charges can be retained and the same machine (rather like a mechanical rammer), for consolidating and pushing the charges, can be used. It is believed that there is now only one other coking plant in the country which uses this charging practice. Unlike the old, the new ovens are of the underfired type and there is access in a basement for individual control to all the burners and flues. Full instrumentation and a control room have been installed. In place of manual quenching, a fully mechanised system has been built and is to be extended to the old battery. The total output from the ovens will now be of the order of 400 tons per day.

At the gathering last week, the Coppée Company was represented by Mr. H. Smith and Mr. G. Mostart, directors, and Mr. L. F. Smith, Mr. J. Campbell, Mr. D. J. Evans and Mr. Sansam, engineers. Of the South-western Division of the Coal Board, Mr. Ralph Evans, marketing director; Mr. R. J. Barritt, carbonisation officer, and Mr. H. McVivar, general manager of No. 3 Area, were among those present, while Mr. H. F. Kimbell represented headquarters staff, and Mr. G. E. Childs, the colliery management To launch the scheme, Mr. R. Evans set in motion for one oven the sequence of pushing, transfer, spray cooling, bunkering and screening. At the conclusion, the whole assembly as well as the workmen at the ovens and Coppée employees, were entertained to high tea by the Coppée Company.

Gazette

THE PARTNERSHIP BETWEEN Mildred Bertha Foulds and Francis Robert Jones, carrying on business as iron and steel merchants, at 54, Gresham Road, Hall Green, Birmingham, under the style of H. L. Foulds, has been dissolved. Debts will be received and paid by M. B. Foulds, who continues.

THE PARTNERSHIP BETWEEN James John Lester, Fred Ewart Fletcher Lester and Joseph Cole, carrying on business as iron and steel scrap merchants, etc., at Gorge Road, Hurst Hill, Bilston, Staffs, under the style of Lester, Son & Cole, has been dissolved. Debts will be received and paid by F. E. F. Lester, who continues.

THE COMPANIES' REGISTRATION OFFICE gives notice that the undermentioned companies have been struck off the register and are thereby dissolved:—CABLE DRUMS, LIMITED; FUEL ENERGISERS, LIMITED; KURUGA COPPER, LIMITED; ST. HELEN'S METAL AIRCRAFT COMPANY, LIMITED; GREEN'S (ENGINEERS), LIMITED; PROSPECT ENGINEERING COMPANY, LIMITED; WHOLESALE CASH FUEL SUPPLIES, LIMITED; WISE (COACHBUILDERS), LIMITED; MILLING TOOLS, LIMITED; NORTHERN COAL & COKE SUPPLY COMPANY, LIMITED; PERCIVAL MEDLICOTT, LIMITED, engineers' merchants; WOLVERHAMPTON ENGINEERING COMPANY, LIMITED.

Death of Mr. J. T. Gray

The death took place last Friday of Mr. J. T. Gray, of Stewart & Gray, Limited, of Paisley Works, Swains Road, London, S.W.17. "Jimmy," as he was known to his many friends in the enamelling trade, was the founder of the Institute of Vitreous Enamellers. His early connections were with the gas industry, and he designed the prototype of the potato-crisp-making stoves. He was a technician of no mean ability and was always happy when he was imparting from his vast store of experience, information of value to the younger generation. He carried through a number of important installations for vitreous enamelling both at home and abroad. The enamelling industry will be greatly the poorer for his passing.

Amalgamated Metal to Extend Activities

The announcement that the group is seeking to extend its activities in directions other than metals, including the export trade, is made by Mr. W. Gardner, chairman of the Amalgamated Metal Corporation, Limited, in his statement accompanying the 1948 accounts.

After referring to the effect of bulk buying, he says: "I do not suggest that it would necessarily be easy, even if the London Metal Exchange were reopened, to re-establish immediately a free market such as we knew before the war, but it is certain that the absence of any market, which precludes the possibility of hedging, adds to the difficulties of our manufacturers and of the metal trade at large."

Metal Industries' Acquisition

The share capital of Cox & Danks, Limited, iron and steel scrap merchants, plant and machinery merchants, etc., of London, N.W.10, has been acquired by Metal Industries, Limited, Glasgow.

The management of Cox & Danks, Limited, will continue in the hands of the present board and Mr. E. F. Cox will continue as chairman.

Grinding Balls

Production Problems Overcome by Centrifugal Casting

By E. F. Farren

An enquiry for 3 in. dia. balls for grinding quartz rock in a ball mill, was received in an Indian foundry from the Hyderabad Gold Development Company, Limited, Hyderabad. Balls of the same diameter, made of manganese steel, had been used previously, but owing to shortage of material, the Author was requested to suggest a suitable grade of cast iron that would withstand shock and severe abrasive action. W.B. Grade Meehanite, a particularly unusual type of metal for heavy abrasive wear, which is practically non-machinable, and has wear-resisting properties comparing favourably with those of manganese steel, was considered a suitable substitute.

On this suggestion an initial order of 36 tons was placed, to be delivered at the rate of 6 tons per month. As each ball weighed 3¼ lb., this meant a total quantity of approximately 22,000 castings. With such a large quantity required for a purely jobbing foundry with an average of ten casting days per month, it would have been costly to provide sufficient moulding boxes to maintain the required production, which was between 300 and 360 balls per cast. Two other major points to be considered were floor space and fettling. Owing to the extra hardness of the metal, the castings produced had to be fettled as little as possible. It was found, by trial, that when the balls were cast statically, an excessively large riser had to be used. Blind risers, top and side risers were tried in turn, but it was found that the time taken to remove the riser stump was longer than that to manufacture the casting, and the yield of good castings low. With these points in mind, centrifugal casting was tried and, after one or two experiments, this method was adopted.

Mould Arrangement

The ball castings were stack moulded. The mould was formed from a series of pancake "cores," made in dry-sand and finally assembled locating one above another in a cylindrical sheet-steel container. The British Moulding Machine Company's type T02 hand squeeze moulding machine was used for making the mould parts. Fig. 1 shows the layout with the "core box" in place. A thick wooden pattern board was screwed on to the turnover table of the squeezer on which the patterns and gating system were fixed. As the castings were symmetrical, only half patterns were used, care being taken in positioning them on the pattern plate. The "core box" was 2½ in. deep by 14 in. dia., and, to reduce wear and tear from rough and constant use, was made of aluminium.

As the "cores" had to have straight sides in order to fit closely and evenly into containers and also to eliminate core-repairing time, the core box was made in two sections and fitted with a hinge and clasp

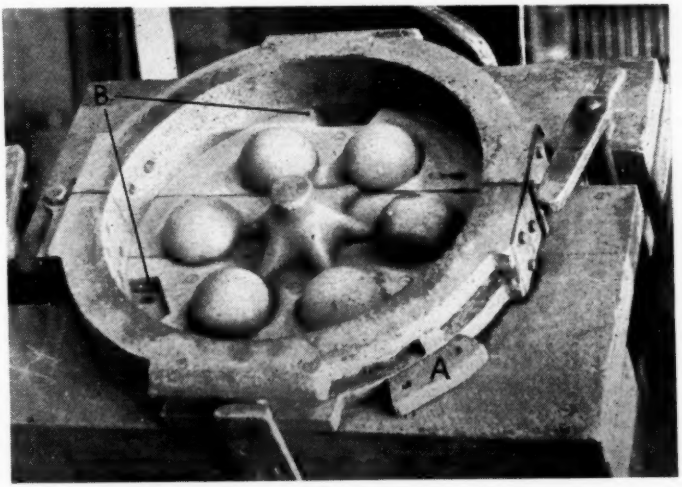


FIG. 1.—LAYOUT WITH "CORE BOX" IN PLACE.

similar to a snap-flask. It was held in position by means of four guide-blocks, two of which can be seen at A, Fig. 1. Cope and drag halves were made on the same pattern board, the only alteration being the replacing and removing of four wooden inserts, two of these can also be seen at B in Fig. 1. This illustration also shows the slots left in the pattern board when the inserts are removed, which left projections on the core; the opposite effect being obtained when the inserts were replaced. This can be clearly seen in the two half-cores at A in Fig. 2. With this simple method the core-maker was able to fit the half pieces together easily and quickly.

The "cores" were made of dry-sand without the use of core-irons or rods. After the sand had been squeezed in the core box and strickled level, a mild

Grinding Balls

steel plate, 16 in. sq. by ¼ in., was placed on the core box and fixed in position by means of two screw-clamps. The table was then rolled over and the plate containing the core box was withdrawn, leaving the sand core ready for the core-oven. The time taken to make one half-piece "core" was approximately two minutes.

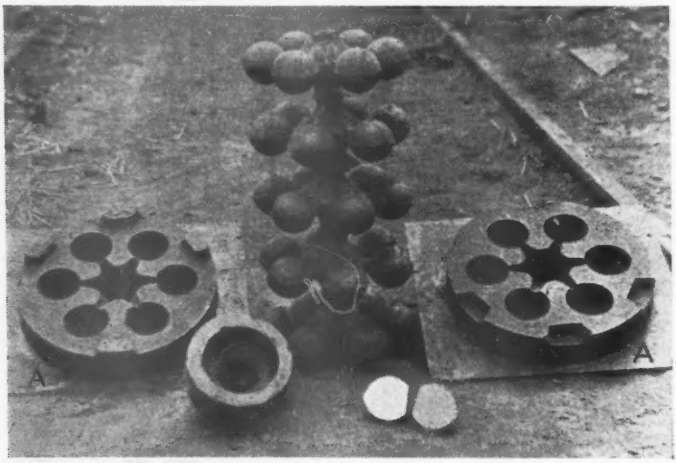


FIG. 2.—FINISHED NEST OF CASTINGS.

Mould Assembly

After drying, the half cores were fitted together and assembled in containers which were made from $\frac{1}{16}$ in. mild steel, 24½ in. deep by 14 in. dia. For convenience of handling, they were made in two sections, each piece being flanged as shown in Fig. 4, and one piece with a round plate welded on the bottom to carry the cores. After assembling the cores, the other half of the container was bolted in position and the complete unit was ready for lifting on to the spinning machine. Each container held five complete cores, *i.e.*, 30 castings, and twelve containers were made ready for casting. At the upper end of the assembly a top plate (Fig. 5), which carried an annular runner ring, was bolted in position.

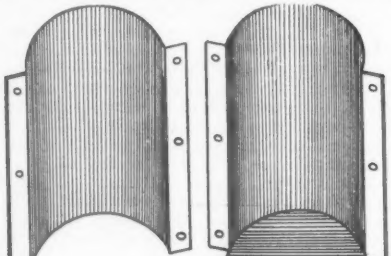


FIG. 4.—TWO HALVES OF THE SHEET STEEL MOULD CONTAINER, ONE BEARING THE BASE PLATE.

Casting

Four centrifugal machines were used, each a separate unit driven by a 1-h.p. motor at a speed of approximately 250 r.p.m. Fig. 3 shows one of the spinners assembled and ready for casting. To prevent the possibility of any accident occurring when the operators were changing the containers on the machines, the metal was poured into one end of an inclined chute which carried it into the spinning mould. Each machine had a separate chute, 4 ft. 6 in. long and carried on a bracket which enabled the operator, by applying a slight downward pressure at the pouring end, to swing the casting end clear of the machine. It was held in place for this purpose by a hook fixed in the floor, and the spinning machine could be unloaded and reloaded with ease and speed.

On both ends of the chute was a reservoir which steadied the flow of metal and also acted as a dirt trap. The machine was set in motion when the metal was poured, no forcing of the metal was required. When the proper amount of metal had been poured, the machine was allowed to "free-wheel" until it finally stopped. It was then dismantled, the container was put on a trolley and conveyed outside and the next one put in place ready for casting. Fig. 3 shows one of the machines mounted and ready for casting. Each machine was cast in rotation and no time was lost in waiting, as the first machine was ready for casting while the fourth was being dismantled and re-

FIG. 5.—MOULD TOP PLATE CONTAINING THE RUNNER RING.

ided. The total time taken to cast 360 balls was proximately 30 minutes. This labour was done by skilled men, four labourers on the machines and ur for shanking the metal.

Fig. 2 shows the finished "nest" of castings. Only slight blow with a hammer was required to dis-

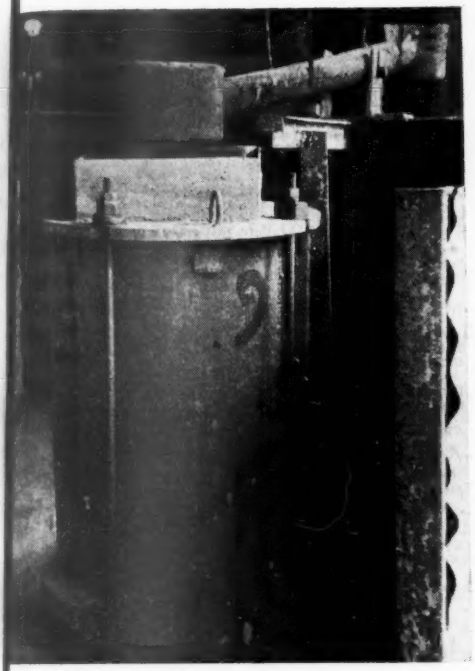


FIG. 3.—SPINNER ASSEMBLED AND READY FOR CASTING.

lodge the castings from the runner and very little fettling was needed to complete the job. One ball was taken from each "nest" and tested; one test casting can be seen, sawn in halves, in Fig. 2. In each case a sound casting was obtained, with a Brinell hardness number of 350 to 400 on the outer surface, and very close-grained. The yield of good castings was 98 per cent., and the total yield to metal poured was approximately 70 per cent. Eighteen tons of these balls have been supplied to the customer, but no report has been yet received from them about the performance of the castings.

THE NORTH-EASTERN MARINE ENGINEERING COMPANY, LIMITED, of Wallsend, is planning additions to the works foundry.

B.E.A. Research Council

Sir Harold Hartley, F.R.S., chairman of the British National Committee and International Executive Council of the World Power Conference and a former chairman of the Fuel Research Board, is to be chairman of an Electricity Supply Research Council which is being established by the British Electricity Authority.

The other members who have accepted invitations to serve are Sir Edward Appleton, F.R.S., Principal and Vice-Chancellor of the University of Edinburgh; Prof. F. E. Simon, F.R.S., Professor of Thermodynamics, Oxford University; Sir David Brunt, F.R.S., Professor of Meteorology, Imperial College, South Kensington; Prof. H. W. Melville, F.R.S., Professor of Chemistry, Birmingham University; Sir Geoffrey Taylor, F.R.S., Yarrow Research Professor of the Royal Society; Mr. V. A. Pask, chief engineer of the B.E.A., and Mr. C. W. Marshall, deputy chief engineer (research) of the B.E.A.

U.K. Scientists to Get E.C.A. Aid

The Economic Co-operation Administration announced last week that it will assist in sending up to 50 British scientists and technologists to the United States for graduate study in leading technical schools and on-the-job training in factories to learn American production methods. The project, which has been approved for one year and may be extended later to cover two years of training, has been undertaken with the co-operation of the British Government, as part of the E.C.A.'s technical assistance programme, which is aimed at increasing European industrial production and efficiency.

After finishing their training in U.S. universities and industries, they will go directly into industry in the United Kingdom or in U.K. overseas territories, or teach in newly expanded university departments of technology. Those who accept university posts will be available for consultation by industry.

British Standards Institution

In the British Standards Institution monthly information sheet for May there is included amongst "amendment slips" PD 903 amendment No. 3 to B.S. 410: 1943, test sieves. In "new work started" there are "methods for the analysis and testing of coal and coke (revision B.S. 1016)," and under the heading of "draft standards circulated for comment" are included CK 1738, heavy-duty electric overhead travelling cranes for use in iron and steelworks, and CK 2458, general metallurgical heat-treatment and testing terms and definitions (2s.).

In the list for June there is envisaged the early publication of B.S. 1563:1949, cast-iron sectional tanks (rectangular) at 5s.

Unless otherwise stated, copies of the relevant documents may be obtained post free from the Institution at 24/28, Victoria Street, London, S.W.1.

Pig-iron and Steel Production in Great Britain

Summary of May Production

The following particulars of pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for June, 1949, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in May, with the number of furnaces in blast; Table II, production of steel ingots and castings in May, and Table III, deliveries of finished steel. Table IV summarises steel-industry activities during six months ended May, 1949.

TABLE I.—*Weekly Average Production of Pig-iron and Ferro-alloys during May*, 1949. (*Thousands of Tons.*)

District.	Furnaces in blast, 28.5.49	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts, Northants, and Essex	24	0.7	14.4	24.1	1.4	—	40.6
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire .. Yorkshire (incl. Sheffield, excl. N.E. Coast) ..	6	—	6.3	—	—	1.4	7.7
Lincolnshire ..	15	—	25.9	—	—	—	25.9
North-East Coast	23	8.1	36.3	0.4	—	1.5	46.3
Scotland	9	0.9	12.3	3.1	—	—	16.3
Staffs., Shrops., Worcs., and Warwick ..	9	—	9.2	1.5	—	—	10.7
S. Wales and Monmouthshire	8	4.1	20.0	—	—	—	24.1
North-West Coast	7	14.7	—	0.2	—	—	14.9
Total ..	101	28.5	124.4	29.3	1.4	2.9	186.5
April, 1949 ..	100	27.6	119.2	26.8	1.8	3.2	178.6
May, 1948 ..	102	27.2	125.4	27.2	1.1	2.8	183.7

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Fini Steel.* (*Thousands of Tons.*)

Product.	1947 (53 weeks).	1948.	1948. May.	1949. April.	1949. Ma
Non-alloy Steel :—					
Heavy rails and Sleepers	7.6	8.9	7.8	9.0	9.
Heavy and medium plates	31.6	36.2	37.6	39.1	42.
Other heavy products	31.8	34.7	34.8	34.8	36.
Light rolled products§ Hot-rolled strip	52.9	59.5	55.6	44.0 17.5	40. 17.
Cold-rolled strip ..	4.6	4.7	4.2	4.6	5.
Bright steel bars ..	4.8	6.0	5.8	5.7	5.
Sheets, coated and uncoated	24.3	26.3	25.4	25.7	28.
Tin, terne and blackplate	12.1	13.5	12.5	12.9	14.
Tubes, pipes and fittings	13.5	15.1	14.5	17.8	19.
Wire	10.8	12.8	12.1	14.1	15.
Tyres, wheels and axles	3.5	3.9	3.4	3.9	4.
Forgings	5.0	6.0	5.3	5.9	6.
Castings	3.0	3.5	3.3	3.4	3.
Total	205.5	231.1	222.3	238.4	261.
Alloy Steel† :—					
Tubes and pipes ..	0.3	0.4	0.3	0.6	0.
Bars, sheets, strip and wire	3.7	4.7	4.6	4.9	5.
Forgings	1.8	2.5	2.2	2.5	2.
Castings	0.6	0.7	0.5	0.6	0.
Total	6.4	8.3	7.6	8.6	9.
Total U.K. production‡	211.9	239.4	229.9	247.0	271.
Less intra-industry conversion ..	19.2	29.0	26.8	31.9	37.
Net U.K. deliveries ..	192.7	210.4	203.1	215.1	233.
Add imported finished steel	2.2	3.4	1.9	10.7	12.
Total deliveries of finished steel ..	194.9	213.8	205.0	225.8	245.

† Excludes high-speed steel. ‡ Includes finished steel produ in the U.K. from imported ingots and semi-finished steel.
§ Excl. wire rods and alloy-steel bars, but incl. ferro-concrete ban

TABLE II.—*Weekly Average Production of Steel Ingots and Castings, May*, 1949. (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots & castings
Derby, Leics., Notts., Northants and Essex	—	—	11.4(Basic)	1.6	0.2	12.6	0.6	13.2
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Cheshire .. Yorkshire (excl. N.E. Coast and Sheffield) ..	2.3	22.3	—	1.2	0.4	25.2	1.0	26.2
Lincolnshire	—	29.7	—	—	0.1	29.7	0.1	29.8
North-East Coast	1.7	60.1	—	0.8	0.5	61.5	1.6	63.1
Scotland	5.4	40.7	—	1.9	0.8	46.9	1.9	48.8
Staffs., Shrops., Worcs. and Warwick ..	—	15.5	—	0.8	0.7	15.8	1.2	17.0
S. Wales and Monmouthshire	10.2	48.1	5.7(Basic)	0.9	0.1	64.5	0.5	65.0
Sheffield (incl. small quantity in Manchester) ..	8.5	26.0	—	8.3	0.6	41.6	1.8	43.4
North-West Coast	0.6	3.1	5.0 (Acid)	0.3	0.1	9.0	0.1	9.1
Total	28.7	245.5	22.1	15.8	3.5	306.8	8.8	315.6
April, 1949	26.2	242.9	18.6	14.0	3.2	297.0	7.9	304.9
May, 1948	27.3	228.1	20.2	13.7	3.4	284.8	7.9	292.7

* Five weeks.

(*Continued at foot of facing page.*)

Personal

MR. E. B. GOLDSON has been appointed joint managing director of F. Hills & Sons, Limited, aircraft-component manufacturers, of Manchester.

MR. EDWARD THORNTON has retired from the board of Blakey's Boot Protectors, Limited, Leeds; his place has been taken by MR. W. E. ALVEY.

MR. H. H. WHEELER has been appointed to the board of Henry Meadows, Limited, petrol and Diesel engine manufacturers, etc., of Wolverhampton.

MR. STANLEY H. L. GREAVES, a director of Textile Machinery Makers, Limited, has been appointed to the board of Platt Bros. Holdings, Limited, Manchester.

MR. C. L. HILL has resigned from the board of the Brush Electrical Engineering Company, Limited, Loughborough. He has been advised, on medical grounds, to reduce substantially his business activities.

DR. H. K. LLOYD will shortly be relinquishing his post on the metallurgical research staff of Sheffield University to take up the newly-created appointment of Lecturer in Metallurgy at Nottingham University.

SIR RONALD W. MATTHEWS, chairman of the Brush Electrical Engineering Company, Limited, Loughborough, and General Refractories, Limited, Sheffield, and a director of many other companies, has been appointed a Deputy Lieutenant of the West Riding.

MR. JOHN LAMB has been awarded the Herbert Akroyd Stuart award, value £50, offered biennially by the Institute of Marine Engineers for the best Paper on the development of the heavy oil engine. His Paper was entitled "Burning of Boiler Fuel in Diesel Engines."

MR. JOSEPH BISHOP, who has served on the technical engineering staff of Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, for the past 17 years, has been appointed general manager of Robert Dempster & Sons, Limited, gas and general engineers, Elland, Yorks.

MR. JOHN F. WEBSTER, member of the Scottish Branch of the Institute of British Foundrymen, has been elected Provost of Arbroath. He was for many years foundry manager with Douglas Fraser & Sons, Limited, and in 1941 was awarded a diploma by the Institute for a Paper presented to his own Branch.

MR. R. W. K. HONEYCOMBE, of the Cavendish Laboratory, Cambridge, has been appointed to the Armourers' and Brasiers' Company research fellowship for two years from October 1. Mr. Honeycombe will work on the inhomogeneity of plastic deformation in metals and the influence of these inhomogeneities on recrystallisation and recovery.

MR. A. W. BLUNT has retired from the boards of Associated Engineering Holdings, Limited, and its subsidiary companies (Bricovmo, Limited, piston and cylinder-liner manufacturers, of Warwick, British Aero Components, Limited, Hinckley, Leics, and the British Piston Ring Company, Limited, Coventry). MR. E. CARPENTER has been appointed a director.

MR. D. KEMP has received a presentation from his colleagues on his retirement from the staff of the British Engineers' Association, with which he was associated for 25 years. He was previously with the National Federation of Iron and Steel Manufacturers (now the British Iron and Steel Federation). Throughout his time with the B.E.A., Mr. Kemp has been in charge of the Intelligence and Statistics Division.

DR. WILLIAM HUME-ROTHERY, F.R.S., a lecturer in metallurgical chemistry at Oxford, has been awarded the Francis J. Clamer medal by the Franklin Institute of the State of Pennsylvania. The award is "in recognition of his brilliant work in scientifically determining and interpreting the structure and behaviour of metallic equilibrium systems." Dr. Hume-Rothery is this year's recipient of the platinum medal of the Institute of Metals for his "outstanding contributions to the science of non-ferrous metals." The Francis J. Clamer medal—a silver medal and certificate—was established in 1943, to be awarded not less than once in five years for meritorious achievement in the field of metallurgy. It will be presented to Dr. Hume-Rothery on October 19 by Mr. Richard T. Nalle, president of the Franklin Institute, at traditional ceremonies in Philadelphia.

PIG-IRON AND STEEL PRODUCTION IN GREAT BRITAIN (*Continued from previous page*).

TABLE IV.—*General Summary of Pig-Iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy).			
						Imports.‡	Output of ingots and castings.	Deliveries of finished steel.	Stocks.†
1938	228	89	—	130	118	16	200	—	—
1947 (53 weeks)	209	136	165	147	145	8	240	195	797
1948	252	172	200	178	174	8	286	214	1,028
1948—December*	253	162	201	176	173	10	282	216	1,028
1949—January	269	163	202	178	178	8	289	224	1,019
February	267	160	201	181	198	13	311	236	1,000
March*	263	158	198	179	199	20	313	242	1,031
April	255	163	198	179	192	20	305	226	1,097
May	263	171	201	187	199	22	316	245	1,121

* Five weeks. † Stocks at the end of the years and months shown. ‡ Weekly average of calendar month.

News in Brief

THE HILL TOP FOUNDRY COMPANY, LIMITED, is erecting a new foundry at West Bromwich.

FULLWOOD FOUNDRY COMPANY, LIMITED, Mossend, is shortly to mechanise its furnace-charging arrangements.

F. A. STANDEN & SONS, LIMITED, of North End, Wisbech, Cambs, is carrying out partial rebuilding of the foundry.

THE SCOTTISH LABORATORIES of the British Cast Iron Research Association have now been moved to Blantyre Industrial Estate, Blantyre, Lanarks.

ORDERS FOR TRANSFORMERS to the value of approximately £225,000 have recently been received by the Brush Electrical Engineering Company, Limited.

MEMBERSHIP OF THE Shipley Technical Institute Engineering Society has now reached 200. Mr. A. Taylor has been re-elected president of the Society.

PLANS for the erection of a new foundry and fettling shop at Riverside Foundry, Marshgate, Doncaster, have been drawn up by Bingham, Flower & Company.

THE COMBINED TIN COMMITTEE has made further interim allocations of tin metal for the second half of 1949. They amount to 3,200 tons, of which 2,165 tons will go to France.

THE NEXT REFRESHER COURSE and conference on sands to be held by the British Cast Iron Research Association will take place at Ashorne Hill, Leamington Spa, from September 29 to October 1.

ACTON BOROUGH COUNCIL has granted approval in principle to a proposal of Associated Brassfounders (Birmingham), Limited, to replace its existing factory in Old Oak Lane, London, N.W.10, by a modern factory.

THE PROPOSED ISSUE of bonus shares and extraordinary general meeting of Glover & Main, Limited, gas engineers, have been postponed owing to the death of the chairman of the company, Sir Ernest Varvill Harvey.

THE CAPITAL BONUS by Hattersley (Ormskirk), Limited, engineers and ironfounders, of one 5 per cent. £1 cumulative preference share for every four 5s. ordinary shares has been approved by the Capital Issues Committee.

THE DIRECTORS of Murex, Limited, metallurgists, of Rainham, Essex, state that the overall demand for the company's products has continued at a satisfactory level and that supplies of steel for the manufacture of winding engines in the event of a strike.

THE WITTON WORKS of the General Electric Company, Limited, is "at home" to members of employees' families on Saturday mornings, and factory managers and foremen are giving up their leisure time to meet visitors and conduct them round the works.

THE NATIONAL ARBITRATION TRIBUNAL has rejected a claim by clerical workers in the engineering industry for an increase in their basic wage rates. The clerks, members of the Clerical and Administrative Workers' Union, had asked for new minimum scales ranging from 30s. 9d. for boys and girls of 15, to £5 14s. 6d. for men of 21 and £4 17s. for women of 21.

FOSTER, YATES & THOM, LIMITED, Blackburn, has delivered a curing pan weighing 58 tons and stated to be the largest ever made in Britain, to the Dunlop factory at Cambridge Street, Manchester. The pan is 26 ft. 9 in. long; its inside diameter is 15 ft., and the door alone weighs 13 tons. It will be used to vulcanise for the chemical industry such products as rubber-lined tanks.

THE SECTION of the Import Licensing Department dealing with applications for licences to import machinery is now at 91, Victoria Street, London, S.W.1, and all applications and inquiries concerning import licences for machinery should now be addressed to the Controller, Import Licensing Department, Board of Trade, Machinery Section, at that address. The telephone number is Abbey 7898.

THE BIRMINGHAM GRADUATE SECTION of the Institution of Production Engineers is holding a convention on "Training and Leadership in Industry" at the University, Bristol Road, Birmingham, on September 3, under the presidency of Prof. T. U. Matthew, Ph.D., M.Sc., Wh.Sch. The morning will be devoted to lectures and discussions on education for industry, whilst the afternoon programme includes visits to appropriate sections of the University.

DURING THEIR VISIT to the United States next October, Sir Steven Bilsland, chairman of the Scottish Council (Development and Industry), and Dr. Christopher Macrae, secretary, will devote part of their time to American firms which might be persuaded to establish plant in Scotland. This is part of a bid to extend Scotland's range of industries. There are at present 14 U.S. companies operating in industrial estates and reconverted factories in Scotland.

AT THE BIRMINGHAM ASSIZES recently, Mrs. M. Ratcliffe, of Harroby Road, Bilston, was awarded agreed £3,500 damages against the Coneygre Foundry, Limited, Tipton, on whose premises her husband was working at the time he was killed in falling from a 25-ft. roof. Agreed judgment was also given to the Coneygre Foundry, Limited, against Howlett & Company, Limited, of Bow Street, Bilston, the dead man's employers, who were sub-contractors at the premises where the accident occurred.

THE MINISTRY OF NATIONAL INSURANCE reminds employers that they should stamp an employee's National Insurance card as usual for any holiday week for which the employee is paid wages, whatever the amount or for which he receives holiday pay of more than 20s. out of funds provided entirely or partly by the employer. The employee must stamp his own card at the non-employed (Class 3) persons' rate for any other holiday week or any week when he stays away from work and is not drawing benefit.

PRODUCTION (gross output) in the constructional engineering trade during 1946 was valued at over £67 million, compared with £19.5 million in 1935, accord-

ing to the Nineteenth Report on the Partial Census of Production, 1946, which deals with this trade. Some of the principal products sold were iron or steel fabricated bridge components (30,634 tons, valued at £1,394,000) and prefabricated steel-house frameworks (84,763 tons valued at £4,854,000). The value of materials, fuel and electricity used was £34 million, compared with £10.5 million in 1935.

AN AGREEMENT for the exchange of technical information and for a licence to manufacture certain products so far exclusively made in the United States, has been reached between the Rapid Magnetting Machine Company, Limited, Birmingham, and the Dings Magnetic Separator Company, Milwaukee, Wisconsin. This special equipment will now be manufactured in the United Kingdom for both home and export markets. Mr. W. B. Lane, managing director of the Rapid Magnetting Machine Company, is at present on an extended tour of the United States and Canada.

THE DIRECTORS of Vokes, Limited, filtration and silencing engineers, of Guildford, announce that shareholders can expect to receive the accounts for the year ended June 30, 1948, not later than the end of October. Delay in presentation has been caused by factors outside their control. Negotiations are proceeding with the Government with the object of reaching a fair settlement of certain contracts carried out during the war, and the directors feel that it would be imprudent to issue accounts or recommend an ordinary dividend until the position has been clarified, which it is hoped will be soon. Trading figures both for the years to June, 1948, and June, 1949, it is added, have been satisfactory.

Overseas Markets for Steel Castings

A most useful survey of overseas markets for steel castings has just been issued by the Board of Trade (Commercial Relations and Exports Department) from information supplied this year by the Department's Overseas Officers. It lists some 30 countries and appends such pertinent data as potential demand, import restrictions, consuming industries, and names and addresses of interested bodies who can be approached.

To cull from the information printed concerning two of the countries listed, it is learned that, in the Argentine, tenders for steel castings for government departments can only be accepted through accredited agents in that country, but it is suggested that a first approach might be made through one or other of the Argentine's Purchasing Commissions attached to their Embassy in London. In the case of Pakistan, a list of four addresses for officers of government departments is quoted together with those for seven local firms. This is the sort of information likely to be of practical value to the export managers of steelfoundries and those persons responsible for the collecting and collating of the information are to be congratulated.

Company News

(Figures for previous year in brackets.)

NEWMAN & WATSON—Dividend of 7½% (same).

MATHER & PLATT—Interim dividend of 4% (same).

DAVIES & METCALFE—Interim dividend of 3% (same).

NORTON INDUSTRIES—Interim dividend of 7½% (same).

JOHN BOLDING & SONS—Interim dividend of 5% (same).

BROOKS & DOXEY (HOLDINGS)—Dividend of 20% (same).

LONDON ALUMINIUM COMPANY—Interim dividend of 30% (same).

E.N.V. ENGINEERING COMPANY—Interim dividend of 7½% (same).

WOLVERHAMPTON METAL COMPANY—Final dividend of 20%, making 40% (same).

MUREX—Final dividend of 12½%, making 20% (final dividend of 10 %, making 16⅔% for 10 months).

ASSOCIATED BRITISH ENGINEERING—Dividend of 12% (same), plus scrip bonus of £4 ordinary stock for every £21 ordinary stock held.

GEORGE SPENCER, MOULTON & COMPANY—Consolidated trading profit for 1948, £180,148 (£155,537); net profit, before U.K. tax, £140,742 (£128,949); to tax, £77,453 (£70,081); general reserve, £50,000 (£40,000); dividend of 7½% (5%), £11,055 (£7,370); forward, £46,052 (£43,818).

WHITEHEAD IRON & STEEL COMPANY—Consolidated accounts for the year ended March 31 show:—Profit after charging management remuneration, administration expenses, etc., £765,444 (£738,440); profit on sale of investments, etc., £4,605 (nil); investment income (gross), £32,966 (£33,245); transfer fees, etc., £74 (£78); to auditors, £1,572 (£1,199); interest, nil (£359); taxation, less over-provision, £369,043 (£410,931); depreciation, £80,803 (£69,065); net profit, £351,671 (£290,209); final dividend of 17½%, making 30% (same); forward, £340,587 (£262,249).

GOODLASS WALL & LEAD INDUSTRIES—Group trading profit for 1948, £2,039,940; exceptional surplus, £325,668; investment income, £75,580; to depreciation, £165,335; auditors' remuneration, £6,378; debenture and loan interest, £14,227; stamp duty on subsidiary capital increase, £3,027; provision against trade investment, £5,028; tax, £1,227,554; interest of minority holders, £66,565; net profit, £951,074, of which £500,796 (£525,293) is attributed to holding company and £450,279 is retained by subsidiaries; brought in by parent company, £146,338 (£139,649); available, £647,133 (£664,942); to reserves, £252,148 (£360,000); preferred ordinary dividend, £17,394 (same); ordinary dividend of 15% (same); forward, £226,382.

W. H. DORMAN & COMPANY—Trading profit to March 31, after administration expenses, management remuneration, etc., £188,799 (£157,460); investments income, £1,559 (£1,010); to depreciation, £24,258 (£20,369); directors' fees, £300 (same); auditors' fees and expenses, £623 (£630); interest on 5% notes, £3,722 (£3,734); pension, £3,901 (£4,064); loss on sale of Government securities, nil (£2,098); trade investment reserve, £6,200 (nil); leaving £151,354 (£127,275); brought in, £8,320 (£8,692); from provisions not required, £50,888 (nil); dividend of 37½% (same); income tax, £64,500 (£51,500); profits tax, £20,500 (£15,000); deferred repairs, nil (£26,500); special depreciation of plant and buildings, £42,000 (nil); general reserve, £60,000 (£20,000); forward, £9,915.

BRITISH STEEL CONSTRUCTIONS (BIRMINGHAM)—The directors state that they are unable to recommend a dividend either for the year ended August 30, 1947, or for the year ended August 28, 1948. In May last a circular was issued to shareholders concerning the delay in the completion of the accounts for the year to August, 1947; the claim of approximately £100,000 made against the Ministry of Works was still the subject of negotiation. The board felt that there was no alternative but to complete the accounts for the two years 1947 and 1948 without taking any credit for the claim. Further, it was proposed at the earliest opportunity to take steps to adjust the capital position of the company and that "the position should be stabilised by the introduction of further capital of a more permanent nature."

Transport Users Committee for Wales

The Transport Users Consultative Committee for Wales has been appointed by the Minister of Transport under the provisions of Section 6 of the Transport Act, 1947. The offices of the Committee, which will consider any matter (including charges) affecting the services provided by the British Transport Commission, will be at the Railway Executive, Queen Street, Cardiff.

Members of the Committee include:—CAPT. H. LEIGHTON DAVIES, assistant managing director of the Steel Company of Wales, Limited, president of the Incorporated Swansea (Metal) Exchange, deputy chairman of the Welsh Plate and Sheet Manufacturers' Association, chairman of the Scrap Committee of the British Iron and Steel Federation, and also a member of the Executive of that body, and a vice-president of the Iron and Steel Institute; MR. W. L. DAVIES, managing director of Davies Steel Specialities, Limited, Pontypridd, Glam; MR. W. CLAYTON RUSSON, president of the Industrial Association of Wales and Monmouthshire; MR. H. LYN JONES, deputy chairman of the South-Western Divisional Coal Board; and MR. E. V. SWALLOW, assistant chief docks manager, South Wales Docks (nominated by the British Transport Commission).

Recent Wills

YOUNG, H. A., retired ironfounder, of Dunstable, Beds	£3,788
HODGKIN, C. E., chairman of the Pulsometer Engineering Company, Limited, Reading	£68,501
HOLLAND, L. G., of the Bennett Furnace & Engineering Company, Limited, Walthamstow, London, E.17.	£9,794
WILLIAMS, J. H., a director of the Gwent Pipe & Firebrick Company, Limited, Pontnewydd, Mon	£16,941
FELD, AUGUST, managing director of Wandleside Cable Works, Limited, Wandsworth, London, S.W.18	£22,135
OSBORNE, C. P., a director of Blackburn, Starling & Company, Limited, manufacturers of lightning conductors, etc., of Nottingham	£12,275
BARON DARYNGTON (the Rt. Hon. Herbert Pike Pease), a former director of Pease & Partners, Limited, pig-iron manufacturers, etc., of Darlington, Henry Stobart & Company, Limited, and Robert Stephenson & Hawthorns, Limited, locomotive builders, etc., of Newcastle-upon-Tyne	£24,134
HINDE, S. H., managing director of Chamberlin & Hill, Limited, ironfounders, of Walsall	£2,589
BATES, W. D., chairman of W. D. Bates & Son, Limited, iron and steel merchants, of Park Royal, London, N.W.10	£925
WARD, P. (MISS), secretary and a director of C. W. Scrouther & Company, Limited, radiator manufacturers, of Manchester	£925
RAILTON, JAMES, late chairman of Stothert & Pitt, Limited, manufacturers of cranes, excavators, etc., of Bath, and a director of Topham, Jones & Railton, Limited, public-works contractors, of London, S.W.1	£205,226

FULLWOOD FOUNDRY COMPANY, LIMITED, of Mossend, is erecting baths at Burnbank Road, Hamilton, Scotland, at a cost of £7,000.

Pease & Partners, Limited

Reduction of Capital

A reduction of the capital of Pease & Partners, Limited, pig-iron makers, etc., of Darlington, from £4,250,000 to £2,127,554 10s. by returning capital in excess of the wants of the company was confirmed by Mr. Justice Wynn-Parry in the Chancery Division.

Mr. Cecil Turner, for the company, said that its colliery undertaking had been taken over under the Coal Industry Nationalisation Act and it was not now carrying on active business. Its capital consisted of 1,250,000 preference shares of £1 and 6,000,000 ordinary shares of 10s. each. The whole of the preference and 3,489,782 ordinary shares had been issued. The preference shares were entitled to a dividend of 5 per cent. It was proposed to return to the holders of the preference shares 12s. 6d. in cash for each share held and to issue to them loan stock to the nominal amount of 10s. per share and to repay to the holders of the ordinary shares 5s. per share. This would involve a repayment of £1,653,695.

The company's steel undertaking had been sold to wholly-owned subsidiary companies for shares in those companies and, in consequence, the company was now a holding company and not engaged in active trading operations. After the reduction of capital it would still have ample funds available to meet any contingency which might arise. It had cash amounting to £803,398 and trustee securities of £1,040,450, so that it had available over £1,800,000 to meet a return of capital of £1,650,000.

Contracts Open

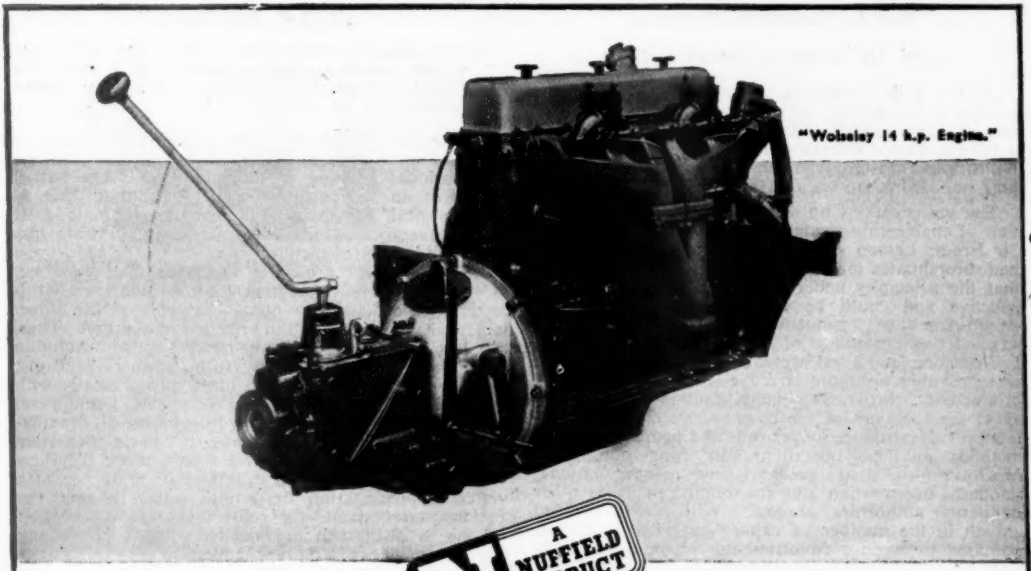
The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

EGYPT, August 23—Water pipe lines, etc., for the Egyptian Ministry of Public Health. (Reference: C.R.E. (I.B.) 14680/49; Room 1073.)

INDIA, September 10—Cast-iron tanks, for the Directorate General of Industries and Supplies, New Delhi. (Reference: C.R.E. (I.B.) 19436/49; Room 1073.)

SALISBURY, September 10—Supply of iron castings, etc., for the County Council. The City Engineer, The Council House, Bourne Hill, Salisbury.

WE REGRET TO ANNOUNCE the death, which took place last Tuesday, of our colleague Mr. "Harry" Fisher, who has been on the advertising staff of the *Iron and Coal Trades Review* for more than 50 years. He was invariably spruce, a good *raconteur*, and possessed a genial character. He was in regular attendance at the old quarter-day meetings of the Birmingham Exchange and at the meetings of the Iron and Steel Institute. Since the war, illness has largely limited his activities. In iron and steel circles his passing will be sincerely regretted by an extremely large number of friends, as Mr. Fisher's genius for making and keeping friends was his outstanding characteristic.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REFINED PIG IRON

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FOR ALL HIGH-DUTY
ENGINEERING CASTINGS

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B.S.I. Annual Meeting

Lord McGowan on Standardisation

At the 48th annual general meeting of the British Standards Institution, last week, the retiring President, the Rt. Hon. Lord McGowan, K.B.E., referred to the greatly increased interest during the past year, both by industry and the Government, in the extension of voluntary standardisation on a national basis.

The investigations by the committee for standardisation of engineering products under the chairmanship of Sir Ernest Lemon set up by the Ministry of Supply had substantiated the view, long held by British industry, that the principles under which the B.S.I. works were effective and could be considerably extended. The Anglo-American Productivity Council had recently stressed the importance of standardisation and simplified practice, and Lord McGowan submitted that there was probably no more effective means for increasing productivity. Progressive standardisation would greatly assist the economy of the country by enabling manufacturers to introduce longer runs and better production methods in their operations. In conclusion, Lord McGowan said that the B.S.I., the pioneer national standards organisation, was collaborating with 34 other standards authorities abroad. With the continued growth in the number of export and import controls exercised by various countries, international standards were becoming increasingly important.

Mr. Roger Duncalfe, the chairman of the Institution, said that Government and industry had jointly agreed that industrial standardisation should be effected through the B.S.I. as the national standards body and that "industry" included all the great professional institutions. Finally, Sir William J. Larke, K.B.E., was formally elected to be the new President of the Institution.

Further Increase in Lead Price

Rise Follows U.S. Advance

An increase in the price of lead was announced by the Ministry of Supply yesterday (Wednesday). The increase is of £1 7s. 6d. per ton and follows an advance of ¼ cent in the United States quotation. The announcement of this latest upward trend in lead was made after our weekly article on non-ferrous metals on page 166 had gone to press.

Since July 12, the first day of operation of the Ministry's new policy of adjusting U.K. metal prices to world prices, lead has been advanced on four occasions, making an aggregate upward movement of £9 12s. 6d. per ton. The current price of good soft pig-lead is thus now £85 2s. 6d. per ton. On July 12 lead was reduced by £6 10s. to £75 10s., but two days later there was an increase of £5 10s., and on July 26 a further advance of £1 7s. 6d. was notified, a similar advance being made again on July 28.

Book Review

Die Physikalisch-chemischen Grund lagen der Metallurgie, Akademie-Verlag, Berlin N.W.7, 1949 (The Physico-chemical Principles of Metallurgy (Berlin, 1949). By W. Baukloh.

Although there exist many excellent textbooks of physical chemistry, this work is a welcome and unconventional addition to the literature. The author contrives, in 300 pages, to scan almost the whole of metallurgical knowledge and manages to build quite heterogeneous and seemingly unrelated subjects into one well-integrated picture.

The theoretical principles are given first place, but at every point of presenting his theory the author is careful immediately to quote examples of the direct practical application of the principle in question. Thus, for instance, one chapter abstractly entitled "Solution Equilibria," deals not merely with the thermodynamic laws, which are well set out, but almost casually with such diverse technical problems as slag liquid-metal reactions, hardness of water, hydrogen in steel, deoxidation, de-sulphurisation, nitriding of steels, degassing of melts and methods to achieve this, phase diagrams (binary and ternary, with examples of alloy and slag systems), precipitation hardening, metal refining, the puddling process and the rôle of lime in basic slags; all this is dealt with organically, without giving any impression of an arbitrary collection.

The remaining nine chapters deal with: thermodynamic principles, chemical equilibria (including a lucid explanation of the law of mass action and its application in metal melting and processing), affinity and kinetics of reactions (catalytic effects amongst others); there are three chapters on electro-chemistry with numerous examples. Corrosion phenomena are discussed under the latter.

Atomic theory is unfortunately dealt with only rather superficially, and it is inevitable that many topics suffer from too cursory a treatment. This might have been mitigated by full references to the literature, but on this score the book is not very satisfactory. References to original Papers are too few and often chosen one-sidedly, quoting less significant sources.

Also, the book suffers from a regrettable isolationism. The uninitiated reader might conclude from a perusal that nearly all of metallurgy and physical chemistry owes its existence to German work (out of a total of 169 references only 22 are to foreign publications, the rest to German ones). Part fault lies perhaps with the inaccessibility of British or American Papers under present conditions, but such "inbreeding" in scientific teaching is undesirable. This slight point of criticism should not, however, detract from the general value of the book to both the student and the practical works engineer wishing for a stimulating refresher course. An early English translation would be useful.

The appendix, and partly the text, contains a well-thought-out collection of physico-chemical data in the form of tables and phase-diagrams, which will be of service for rapid reference.

H. J. G.

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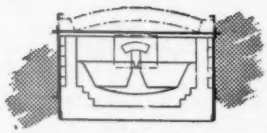
'341'
DOLOMITE BRICK



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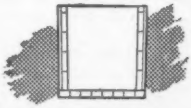

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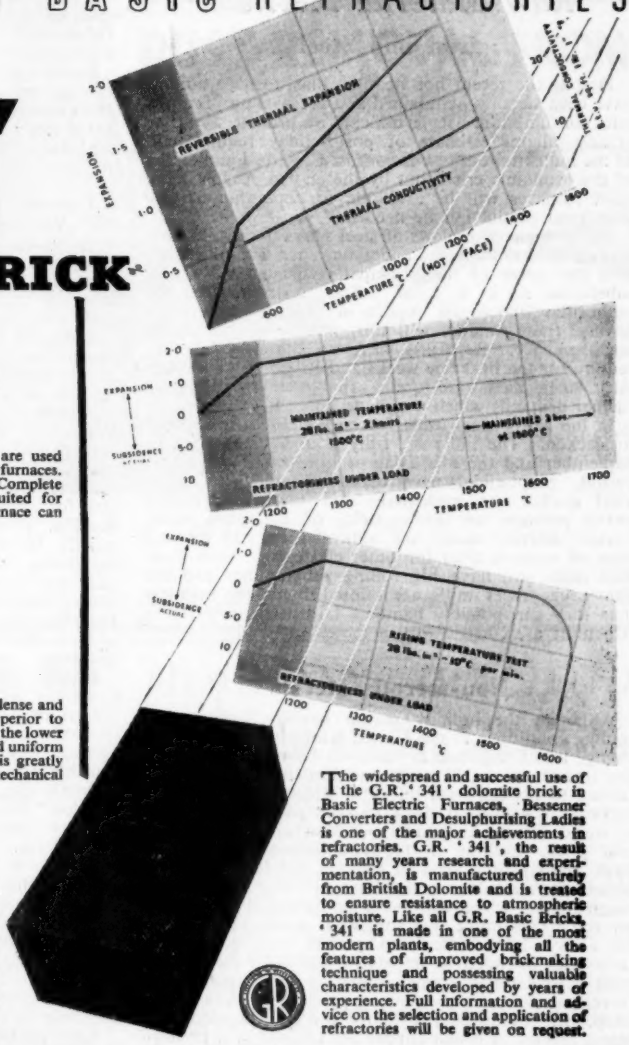

The widespread and successful use of the G.R. '341' dolomite brick in Basic Electric Furnaces, Bessemer Converters and Desulphurising Ladles is one of the major achievements in refractories. G.R. '341', the result of many years research and experimentation, is manufactured entirely from British Dolomite and is treated to ensure resistance to atmospheric moisture. Like all G.R. Basic Bricks, '341' is made in one of the most modern plants, embodying all the features of improved brickmaking technique and possessing valuable characteristics developed by years of experience. Full information and advice on the selection and application of refractories will be given on request.

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311

Raw Material Markets

Iron and Steel

Despite the recent hot weather, blast-furnace outputs have been steadily maintained and are passing promptly into consumption. It is difficult at present to arrive at any reliable estimate of post-holiday requirements as the industrial outlook is confused by the complexities of the economic crisis, but by the end of August more blast furnaces will be available for operation should additional production be needed.

The volume of imports of steel semis during the past two or three months has undergone such a rapid expansion that most of the principal consumers have now substantial stocks in hand. Such restrictions as the authorities choose to impose in order to adjust the adverse trade balance will thus involve no immediate inconvenience. Re-rollers have all the material they require for the next few weeks and Belgian and Luxemburg steel plants are quite capable of meeting any further demands which are made upon them.

In the heavy steel trade forward business is inclined to slacken. The mills are fully booked to the end of September and there is a lag of bookings beyond that period. Shipbuilders never cease to complain that their steel quotas are inadequate and there is certainly heavy pressure on the capacity of the plate mills. Earlier delivery dates are indicated for the normal sizes of sections than for other classes of rolled steel. Rail mills still have big rolling programmes and the light-gauge sheet mills are offered far more business than they can possibly handle. Urgent inquiries from Argentina are conspicuous in the export trade.

Non-ferrous Metals

Although the holiday season has made for quiet trading conditions in the United Kingdom, the spirit of change is still apparent in values in New York. Copper has firmed up at 17⅞ cents and lead has strengthened further to 14½ cents per lb. The Ministry of Supply, in accordance with its decision to keep pace with changes in world values, has made a further alteration in the lead price, resulting in the establishment before the Bank holiday of a level of £83 15s. per ton. Another adjustment made was in the Ministry's buying price for rough copper, which was increased from £70 to £77 10s. per ton. This move was somewhat unexpected, but it has always been difficult to predict what course the authorities intended to pursue in regard to the adjustment of this rough copper quotation. Presumably the Government is anxious that copper residues, low-grade scrap, etc., should pass regularly into consumption, but unless makers of rough copper are assured of a reasonable return, it is impossible for them to pay the current price for their raw material. Moreover, lately, owing to the firmer tone in the refined copper quotation, holders of secondary metal have been inclined to insist upon higher prices for their material.

Judging from recent reports, stocks of both copper and zinc are on the up grade, and we shall find that our reserves of these metals at the half-year stand at a level substantially higher than at the beginning of 1949. Information regarding the Ministry's forward purchases is incomplete, but it is very likely that unless there is a marked improvement in the rate of usage during the coming months there will be a further increase in stocks by the end of the year. In America, stockpiling of strategic materials continues and there is no real evidence of any change of intention in this respect on the part of the U.S. authorities.

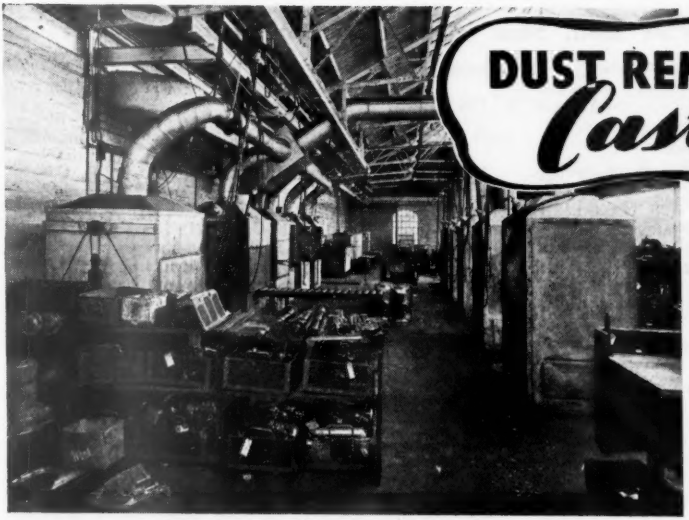
Universal Testing Machine. Tangyes, Limited, Cornwall Works, Smethwick, Birmingham, has just issued a particularly pleasing brochure (No. 638) which describes and illustrates a 25-ton universal testing machine. This machine, which carries out compression, beam, shear bending and transverse tests, is very different from the classical type. It requires no foundations and takes up much less space, while it is exceptionally neat in design. The 12-page brochure, which shows up these features well, is available to our readers on writing to Smethwick.

Mobile Cranes. From Ransomes & Rapier, Limited, Waterside Works, Ipswich, we have received two leaflets describing and illustrating an 8½-ton mobile crane. The first one on super-calendar paper has been used to give a general description showing modification for various duties and an abridged technical specification. The second, also a four-page leaflet, is a strictly technical specification. A graph shows the maximum loading with a standard-, short-, medium- and long-extension jib at various positions. As these cranes find much use in foundry yards, these two pamphlets should find a place in our readers' collections of trade literature. They are available on application to Ipswich.

Rotary Crucible Furnace.—The Morgan Crucible Company, Limited, has sent us a four-page leaflet carrying an artistic coloured front cover which describes and illustrates a new type of rotary gas- or oil-fired crucible furnace especially designed for melting swarf. The crucible departs from the conventional shape to assume a bottle-like form. The reviewer found the green interior "turn-up" somewhat of a colour clash, which detracts from the well set out and nicely-coloured centre page.

Electronic Controls. A 20-page catalogue received from Elcontrol, Limited, 28a, Tilehouse Street, Hitchin, describes and illustrates apparatus connected with the interesting subject of invisible rays and their application to manufacturing controls. While the reviewer has seen but few applications of this type in foundry practice, there is every reason to believe they will find increasing use with the passage of time. The pamphlet is available to readers on writing to Hitchin.

Crucible Furnaces. A leaflet (F.D. 6) received from the Morgan Crucible Company, Limited, Battersea Church Road, London, S.W.11, describes and illustrates a portable 32-lb. brass capacity crucible. It is oil-fired from a self-contained paraffin burner. Such a charge as is indicated is melted in 25 to 30 minutes. The leaflet is neatly produced and makes effective use of orange printing.



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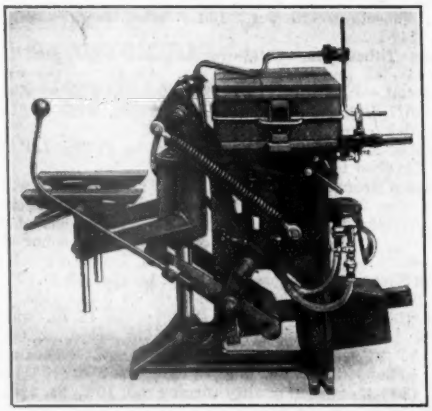

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Current Prices of Iron, Steel and Non-ferrous Metals

(*Delivered, unless otherwise stated*)

August 3, 1949

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £10 4s.; Birmingham, £10 0s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £11 15s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 2s. 6d.; South Zone, £12 5s.

Scotch Iron.—No. 3 foundry, £11 18s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £12 14s. 6d. South Zone, £12 17s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 4s. 6d.; South Zone, £13 7s.

Cold Blast.—South Staffs, £15 16s. 6d.

Hematite.—Si up to 2½ per cent., S & P over 0.03 to 0.05 per cent.; N.-E. Coast and N.-W. Coast of England, £11 16s. 6d.; Scotland, £12 3s.; Sheffield, £12 9s.; Birmingham, £12 15s.; Wales (Welsh iron), £11 16s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 8s.

Basic Pig-iron.—£9 17s. 6d., all districts.

FERRO-ALLOYS

(*Per* £75 10s. *ton unless otherwise stated, basis* 2-*ton lots, d/d Sheffield works.*)

Ferro-silicon (6-ton lots).—20/30 per cent., £25 15s.; 40/55 per cent., £32 10s.; 70/85 per cent., £49.

Ferro-vanadium.—35/50 per cent., 15s. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 6s. 5d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3½d. lb.

Ferro-tungsten.—80/85 per cent., 7s. 9d. lb.

Tungsten Metal Powder.—98/99 per cent., 8s. 9d. lb.

Ferro-chrome.—4/8 per cent. C, £60; max. 2 per cent. C, 1s. 5d. lb.; max. 1 per cent. C, 1s. 5½d. lb.; max. 0.15 per cent. C, 1s. 6½d. lb.

Cobalt.—98/99 per cent., 12s. lb.

Metallic Chromium.—96/98 per cent., 5s. 1d. lb.

Ferro-manganese (blast-furnace).—78 per cent., £25 3s.

Metallic Manganese.—94/96 per cent., carbon-free, 1s. 9 d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., £16 16s. 6d.; tested, up to 0.25 per cent. C (100-ton lots), £17 1s. 6d.; hard (0.42 to 0.60 per cent. C), £18 16s. 6d.; silico-manganese, £23 19s.; free-cutting, £20 1s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £22 4s.; case-hardening, £23 1s. 6d.; silico-manganese, £26 6s. 6d.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £19 16s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 1s. 6d.; acid, up to 0.25 per cent. C, £23 1s. 6d.

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Plates, ship (N.-E. Coast), £20 14s. 6d.; boiler plates (N.-E. Coast), £22 2s.; chequer plates (N.-E. Coast), £22 19s. 6d.; heavy joists, sections and bars (angle basis), N.-E. Coast, £19 13s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 6s.; flats, 5 in. wide and under, £22 6s.; rails, heavy, f.o.t., £19 2s. 6d.; hoop and strip, £23 1s.; black sheets, 17/20 g., £28 16s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £35 14s. 9d.; nickel-chrome, £50 6s. 9d.; nickel-chrome-molybdenum, £55 9s.

Tinplates.—I.C. cokes, 20 × 14, per box, 41s. 6d., f.o.t., makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £107 10s.; high-grade fire-refined, £107; fire-refined of not less than 99.7 per cent., £106 10s.; ditto, 99.2 per cent., £106; black hot-rolled wire rods, £116.

Tin.—99 to under 99.75 per cent., £569; 99.75 to under 99.9 per cent., £572 10s.; min. 99.9 per cent., £577.

Zinc.—G.O.B. (foreign) (duty paid), £63 10s.; ditto (domestic), £63 10s.; "Prime Western," £63 10s.; electrolytic, £64 5s.; not less than 99.99 per cent., £65 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £85 2s.6d.; ditto (Empire & domestic), £85 2s.6d.; "English," £86 2s. 6d.

Zinc Sheets, etc.—Sheets, 10g. and thicker, ex works, £77 10s.; rolled zinc (boiler plates), ex works, £75 10s.; zinc oxide (Red Seal), d/d buyers' premises, £63 10s.

Other Metals.—Aluminium, ingots, £90; antimony, English, 99 per cent., £160; quicksilver, ex warehouse, £18 10s.; nickel, £224.

Brass.—Solid-drawn tubes, 19½d. per lb.; rods, drawn, 10½d.; sheets to 10 w.g., 16d.; wire, 16½d.; rolled metal, 14½d.

Copper Tubes, etc.—Solid-drawn tubes, 19½d. per lb.; wire, 144s. 9d. per cwt. basis; 20 s.w.g., — per cwt.

Gunmetal.—Ingots to L.G.2 (85/5/5/5), £72 to £90; L.G.3 (86/7/5/2), £80 to £118; Gl (88/10/2), £125 to £150 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £126 to £170; L.P.Bl, £88 to £118 per ton.

Phosphor Bronze.—Strip, 22½d. per lb.; sheets to 10 w.g., 24½d.; wire, 24½d.; rods, 23d.; tubes, 27½d.; chill cast bars: solids, 23d., cored, 24d.; 10 per cent. phos. cop., —; 15 per cent. phos. cop., —; phosphor tin (5 per cent.), —. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 1s. 4½d. per lb. (7%) to 2s. 1d. (30%); rolled metal, 3 in. to 9 in. wide, × .056, 1s. 10½d. (7%) to 2s. 7d. (30%); to 12 in. wide, × .056, 1s. 11d. to 2s. 7½d.; to 25 in. wide, × .056, 2s. 1d. to 2s. 9½d. Spoon and fork metal, unsheared, 1s. 9½d. to 2s. 5½d. Wire, 10g., in coil, 2s. 3½d. (10%) to 3s. 0½d. (30%). Special quality turning rod, 10%, 2s. 2½d.; 15%, 2s. 7d.; 18%, 2s. 11d.

Obituary

MR. W. E. GLAZE, brass and ironfounder of Kingswinford, Staffs, died last Sunday

MR. WILLIAM REID STARK, foreman engineer at the Sun Foundry of Stewarts and Lloyds, Limited, died recently.

MR. DAVID C. BRUCE, late secretary of the Caledon Shipbuilding & Engineering Company, Limited, Dundee, died recently.

MR. ALBERT EVELYN LEACH, who was with the Daimler Company, Limited, Coventry, for 43 years, died last week. He was 70.

MR. WALTER ROXBURGH, who was for nearly 20 years foundry manager at the British Thomson Houston Company Limited's works at Rugby, died recently. He was 75.

MR. BENJAMIN EDWIN HIPKINS, late director of John Fraser & Son, Limited, manufacturing engineers and boilermakers, of Millwall, London, E.14, died last week at the age of 74.

MR. JOHN N. WILLIAMS, who was master moulder with Charles Carr, Limited, bellfounders, Smethwick, died on July 28 at the age of 81. He was at one time in business on his own account at the Vine Foundry, Smethwick.

House Organs

The Nickel Bulletin, Volume 22, *Number* 6.—Recent technical Papers abstracted in the June issue include L. S. Fulton's "Forging Alloys for High Temperature Service"; a reference to the first report in a series covering an investigation of the factors governing notch toughness in ferritic materials. This instalment deals with the effect of grain size. "Nickel Alloys *v.* Hydrochloric Acid," the concluding item in a symposium in Corrosion Forum, is another subject of special interest. The 76th Annual Mint Report, which contains reference to nickel and cupro-nickel coinage, is briefly reviewed. Copies of the "Nickel Bulletin" can be obtained on application to the Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

Murex Review, Vol. 1, *No.* 3. Published by Murex Limited, Rainham, Essex. This issue contains a lengthy yet absorbing article by Mr. J. Lomas on "Sheffield Steel—its History." In it the author traces developments step by step from the 14th century to modern times and illustrates the pageant by reproducing from famous engravings and prints. Additionally, there is an account of the method used by the company for the determination of tungsten in ferro-tungsten, together with a series of abstracts from work pertaining to metal alloys and powders.

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FERRO-SILICON
FERRO-ALLOYS
BRIQUETTES
ALL NON-FERROUS
METALS & ALLOYS
MOULDING SAND

NOTICE

Small Advertisements in this section of the Journal are accepted at the *prepaid* rate of 20 words for 5/- (minimum charge) and 2d. per word thereafter. Box number advertisements 2/- extra. Instructions together with remittance must be received not later than first post on Friday for inclusion in Thursday's issue addressed to the Advertisement Manager, Foundry Trade Journal, 49 Wellington St., London, W.C.2.

Situations advertised under this heading are available only to applicants excepted from the Control of Engagement Order, 1947, No. 2021.

Replies to Box Numbers to be addressed to:— "Foundry Trade Journal," 49, Wellington Street, London, W.C.2.

SITUATIONS WANTED

FOUNDRY MANAGER (37), B.Met. degree, desires post of responsibility; 12 years in charge of foundry for firm of repute producing h.p. valve castings and jobbing work; good knowledge of Siemens O.H and. Stock Converter processes.—Box 182, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

A GOOD Technical Man, preferably with foundry experience, wanted for a Scottish Light Castings Foundry on mass production, for research on Sand Control and Metallurgy, to control improvement in quality and output.—Box 184, FOUNDRY TRADE JOURNAL.

ASSISTANT to Chief Works Metallurgist required for works in the Manchester area; applications are invited from men with practical and technical knowledge of the operations and metallurgy of the open-hearth steel melting furnace, heat-treatment of castings, refractories, and general engineering materials.—Full particulars as to training, career and wages, to Box 120, FOUNDRY TRADE JOURNAL.

AN old-established Firm of Non-ferrous Founders in the Croydon area, specialising in jobbing and repetition work, have a number of vacancies for Skilled MOULDERS.—Application, stating age and experience, to Box 956, FOUNDRY TRADE JOURNAL. This advertisement appears by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947.

SITUATIONS VACANT—*Contd.*

EXCELLENT opportunity energetic practical FOUNDRYMAN, preferably already calling trade, sell new proposition interesting all foundries.—Box 952, FOUNDRY TRADE JOURNAL.

FOREMAN for Coreshop, also FOREMAN on Closing Track, required by Mechanised Midlands Ironfoundry.—Box 168, FOUNDRY TRADE JOURNAL.

GENERAL PATTERNSHOP FOREMAN required for Engineering Company in the Manchester area; used to both specialised production and general mixed classes of work.—Full particulars as to training to Box 122, FOUNDRY TRADE JOURNAL.

GENERAL FOREMAN required for modern mechanised Cast Iron Foundry, South Yorkshire; applicants must have all round experience of foundry technique and good educational background; excellent prospects.—Particulars of training, etc., and salary required, to Box 162, FOUNDRY TRADE JOURNAL.

JUNIOR Laboratory Assistant required to train as CUPOLA METALLURGIST.—Box 170, FOUNDRY TRADE JOURNAL.

METALLURGAL CHEMIST required, age 20-23, for Steel Foundry Laboratory in the Manchester area.—State age, experience, and salary required, to Box 156, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE required for the Sale of Industrial Leather Gloves and Aprons; must have sound connection amongst large users.—Write, in confidence, to J. MOON & SON, 94, Sclater Street, London, E.1.

REQUIRED Progressive, Active, Cultured, SALES REPRESENTATIVE, with thorough experience of foundry sand, refractory and pig-iron materials; state in confidence age, experience, terms; for permanent head office situation.—Apply Box 134, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE, with extensive connections foundry trade, London and Home Counties, wishes to act as part-time Representative or Agent for crucible manufacturers or yellow metal ingot manufacturers.—Box 102, FOUNDRY TRADE JOURNAL.

JUNIOR FOUNDRY FOREMAN (age 38), desires change; experience loam, dry and green sand; coremaking, mechanisation and furnace, engineering, jobbing and marine engineering, cast iron and non-ferrous; City and Guild, first-class.—Box 150, FOUNDRY TRADE JOURNAL.

QUALIFIED FOUNDRY METALLURGIST Desires change; experienced in control of high-duty and alloy irons, melting practice, and sands for small and large I.C. engine castings; similar position desired in Midland area.—Box 138, FOUNDRY TRADE JOURNAL.

AGENCIES

AGENTS to sell Repetition Iron Castings required by well-known Yorkshire firm.—Apply, with details of ground covered, etc., quoting Ref. 703, to Box 106, FOUNDRY TRADE JOURNAL.

WANTED.—AGENTS for London, Midlands and Scotland, with established connections in Foundries, Engineering Works, etc., for the supply of Specialised Plant and Equipment.—Box 174, FOUNDRY TRADE JOURNAL.

AGENCY WANTED.

ESTABLISHED Firm of Foundry Specialists, with City of London offices, wish to represent Provincial Foundry with London area connections, on commission basis.—Box 178, FOUNDRY TRADE JOURNAL.

NOTICE

MIDDLESBROUGH EDUCATION COMMITTEE.

CONSTANTINE TECHNICAL COLLEGE.
Principal: D. A. R. CLARK, M.Sc.(Tech.), M.I.Mech.E.

FULL-TIME Courses are provided to prepare Students for College Diplomas in Metallurgy and Foundry Technology.

The courses cover six months' study in each of three years, the remaining six months is normally spent in industry. The sessional fee varies between £6 6s. and £10 10s. per session (next session begins on 19th September, 1949). Application forms for entry and particulars of required education standard may be obtained from the Principal of the College.

S. HIRST,
Director of Education.

Education Offices, Middlesbrough.
July, 1949.

BUSINESS FOR SALE

PROGRESSIVE Non-ferrous Foundry for Sale, East Midlands area; excellent connections and goodwill, with orders both current and pending; suitable for two working partners or as Branch Foundry for Parent Company; latest certified balance-sheet for year ended 30th June, 1949, available to genuine inquirers; present proprietor desires to retire for medical reasons.—Box 176, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

WANTED.—One Sand Mill; 4-6 ft. pan; automatic discharge.—Box 166, FOUNDRY TRADE JOURNAL.

WANTED, in almost any condition, Travelling Crane; to take hand or electric block of 2-3 ton capacity; span approximately 24 ft.—State location and price required to Box 146, FOUNDRY TRADE JOURNAL.